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REPORT

ON THE

MARITIME CANAL,

CONNECTING THE

MEDITERRANEAN AT PORT SAID,

WITH THE

RED SEA AT SUEZ.

BY

CAPTAIN RICHARDS, R.N., F.R.S.,

HYDROGRAPHER OF THE ADMIRALTY.

AND

LIEUT.-COLONEL CLARKE, C.B., R.E.,

DIRECTOR OF ENGINEERING AND ARCHITECTURAL WORKS, ADMIRALTY.

FEBRUARY, 1870.

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REPORT.

In accordance with instructions from the Lords Commissioners of the Admiralty, contained in a letter from their Secretary, dated the 30th December, 1869, directing us "to proceed to Egypt, and to obtain on the spot the fullest information in our power as to the present condition of the Suez Canal and the Works proposed to be carried out in connection with it, and to report to what extent the Canal may be expected to be available for the purposes of Her Majesty's Naval Service, including the Transport Service, to and from the East," we have now the honour to make the following Report:—

1. Leaving London on the 13th of January, we proceeded through France to Marseilles, thence to Spezzia and Brindisi, at each of which places we remained a short time to inspect the engineering and naval works in progress, and reached Alexandria on the 28th of January, where H. M.'s surveying vessel "Newport," Capt. Nares, was waiting to convey us to Port Said.

2. Sailing from Alexandria at noon of the 29th, Port Said was reached early on the morning of the 30th; on the passage were passed the three iron pile lighthouses on the Rosetta mouth, Brulos Point, and Damietta entrance of the Nile, which are all but complete, and when lighted will prove most useful guides to vessels passing along this low and shallow coast, where the currents are uncertain, and after westerly winds sometimes attain a velocity of 2 miles an hour, with an indraught setting strongly into the bights: on this account vessels will do well not to approach the shore nearer than 7 or 8 miles. The high light of Port Said, which stands at the inner end of the western breakwater, was seen at a distance of 25 miles; and bringing it on a bearing, S. W. $\frac{1}{2}$ W., we steered in on that course, passing the end of the western breakwater, within $\frac{1}{4}$ of a mile, in 5 fathoms of water, and then between the buoys which mark the channel, into the inner basin, carrying 25, 26, and 27 feet of water, occasionally 28 feet, where the vessel was secured to the mooring buoy of the "Messageries Impériales."

3. No time was lost in communicating with the English vice-consul, who introduced us to the Egyptian governor, and to the

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officials of the Canal Company, *viz.*, M. Pointel, Captain in the French Imperial Navy, chief of the transit and navigation departments at Port Said, and M. Blondel, at present the resident chief engineer for the whole of the Canal works; from these gentlemen we received the most ready offers of assistance, and a promise that the whole of the drawings and other documents in their possession should be placed at our disposal.

4. During the day a cursory examination of the beach line to the westward of the Port, and of the Port itself was made; from which it was decided that it would be desirable to make a more detailed survey of it than already existed; it was arranged accordingly to leave behind a party from the "Newport," for this purpose, while we proceeded with the examination of the Canal.

5. The plan which appeared most advisable to adopt, with the view of carrying out our instructions to the greatest advantage in the time at our disposal, was as follows:—To proceed, in the first instance, through the Canal to Ismailia, there communicate with M. Guichard, the chief administrator of the Company, in the absence of M. de Lesseps; thence on to the southern end of the Canal at Suez; and after inspecting the Government and the Company's works there, to return over the same ground to Port Said, finish the survey, and make a further examination of that locality; and, finally, to complete our operations at Ismailia, by examining Lake Timsah. By these means we should have the opportunity of dropping parties to observe the tides at different points, and of making the fullest investigation in our power of the Canal itself, probably under varying conditions.

6. On the morning of the 31st we were joined by M. Le Baron La Tour, an officer of the Company, whom M. Guichard obligingly attached to us during the whole of our stay; and the intelligence and perfect local knowledge possessed by this gentleman proved of the greatest service to us throughout. Leaving Port Said on the same morning, we proceeded to carry out the arrangements, as above explained, and, having completed them, finally quitted Ismailia on the 8th February, for Cairo, by rail. The "Newport" returned the same day to Port Said, where, assisted by the "Prompt," Transport tender, she remained sounding the Port and its approaches, and making sections of the former, until the 11th February, when she left for Malta.

7. It will be seen, then, that twelve days were occupied on the Canal and at Port Said, and during this time every opportunity was taken advantage of to gain the fullest information on the subjects pointed out

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in our instructions, both by ourselves and the surveying officers of the "Newport." In these instructions there are three principal points to which attention is drawn, *viz.*:—

The present condition of the Canal;

The works proposed to be carried out in connection with it; and

The extent to which it may be expected to be available for Her Majesty's Naval Service.

8. Before entering into a detailed description of the present state of the Canal, or of the means which were resorted to in order to gain a correct knowledge of its condition, it seems desirable to note briefly the extent and character of the work, as determined on by its designers and constructors, and it will be then more readily seen to what extent these conditions have been fulfilled.

9. The whole length of the Canal from the High Lighthouse at Port Said to its junction with the Red Sea at Suez, may be stated as nearly as possible, at 88 geographical miles; of this distance 66 miles are actual Canal, and 22 miles of the navigation runs through the three lakes, *viz.*, Timsah, and the great and small Bitter Lakes; excavations had to be carried out, however, throughout the whole length of Lake Timsah; of the small Bitter Lake, and a portion of the great Lake, leaving a distance only of 8 miles in the latter, where the natural depth exceeded that of the Canal, and where, consequently, none were necessary.

10. The width of the Canal at the surface, throughout the greater part of its length, was finally decided to extend to 325 English feet, having a floor 72 feet wide in the centre, with a depth of 26 feet, sloping up 2 to 1 till within five feet of the water surface, where the section is for 50 to 60 feet, either level or with horizontal benches, ending in slopes of 5 to 1; at three places, however, where its course runs through high ground, and where the labour of removing the soil would have been attended with very great expense, and occupied a considerable time, the width has been reduced to 195 feet, with slopes of 2 to 1; these three spots occur in the neighbourhood of El Guisr, Sérapéum, and Chalouf, and are respectively 8, 5½, and 4 miles in length, making, in the whole, about 18 miles of narrow cutting. It will thus be seen that the Canal was generally to have a water way 26 feet

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deep for a width of 72 feet, 20 feet deep for 95 feet, and 15 feet, for a width of 112 feet.

11. In order to test to what extent these intentions had been carried out, it was necessary to make accurate sections of the Canal throughout its length, and 52 of such sections were made accordingly, exclusive of eight, which were subsequently taken across Port Said; the results proved that on the whole, with a few exceptions to be noticed presently, the work had been fairly completed according to the original, or, rather, the modified design; and though it is not to be doubted that the opening was probably in some degree premature, and that though much remains to be done to improve and facilitate the transit, especially for large ships, yet it is at the present moment undeniably a navigable Canal for vessels of considerable draught and tonnage, and its success has probably far exceeded the most sanguine expectations of its warmest supporters; it must not be understood that there is the exact depth and breadth uniformly throughout the Canal, which it was the intention of the engineers there should be; the deepest water, for instance, as shown by our sections, is not always precisely in the centre, nor is there always the exact width which was laid down; occasionally it is less, in some cases even greater, but the depth does not differ more than was to be expected under the circumstances, or so much as materially to affect its practical value, with the exception of the cases now to be noticed, and which are in course of being remedied.

12. The first of these faults, and where a dredger was at work removing it, occurs at section 19 (*see* chart and sections), 33 miles from Port Said, between Kantara and El Guisr, here the greatest depth is 22 feet, but only for a width of 30 feet, and for a width of 80 feet, a depth of 20 feet only can be commanded; this occurs at Lake Ballah, where there is no eastern embankment to the Canal above water.

13. The second bad place occurs at section 27, 44¾ miles from Port Said, just where the Canal proper commences, at the south end of Lake Timsah; here also 22 feet is the greatest depth and that only at one spot; 20 feet can be carried for a width of 55 feet, and 18 feet for a width of 72 feet. A dredge was also at work deepening this spot.

14. The Sérapéum rocky section forms, or rather did form, the next and greatest difficulty. The thin strata of gypsum, which extends more or less along this section, at a depth of 17 feet below the water line, suddenly increased for a length of about 80 yards, from a few inches

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to a thickness of 7 feet, and which, lying between two trial borings, was unfortunately not detected till after the water had been let in, and close on to the time fixed for the completion of the works. When discovered there was scarcely 17 feet of water over it, but at the time of our examination it had been almost removed by blasting and dredging; three dredges were at work, and we witnessed huge blocks of the stone being brought up by the buckets, to the no small damage of the latter, which were split and broken through the tearing away of the rock by the powerful steam machinery; the efforts indeed which were being made to remove this difficulty were very great, regardless of every obstacle, and some sections with which the engineer was good enough to supply us, confirmed by some eight we made ourselves, left no doubt that they had all but been overcome; and we have every reason to conclude that, since our visit, this part of the Canal, as far as depth is concerned, has been made equal, if not superior, to any other.

15. At the distance of a mile south of the Sérapéum operations, or 51½ miles from Port Said, at section 35, there is another shallow place where 22 feet is the greatest depth, for a width of 50 feet; for a width of nearly 70 feet not more than 20 feet can be carried, and for a width of 80 feet there is no more than 18 feet; this obstacle was to be removed by the dredges immediately.

16. The last weak place to be noticed is at section 47 within three miles of the Suez entrance of the Canal, and here not more than 23 feet was found, and for a width of 50 feet no greater depth than 22 feet; this, however, was at low water, and it is to be borne in mind that at this end of the Canal a rise and fall of the tide may be depended upon to the extent of from 4 to 6 feet; a dredge was at work improving this part, which at present is probably the most imperfect portion of the Canal.

17. Independently of the weak points which have now been described, some of which have been already remedied, and all of which it may fairly be expected will be so, within three or four months from the time of our visit—early in February—the next difficulties are the curves, five in number, in passing most of which great care and attention will be necessary in piloting a long vessel. The first occurs immediately after entering the Canal from Port Said, but it is so moderate that there is little difficulty in passing it; two others occur between Kantara and El Guisr; the latter, just before entering Lake Timsah from the north, is the sharpest in the Canal, and is in course of being widened. The fourth is also rather a sharp turn, and is near the south end of the Little Bitter Lake; the fifth and last is within two

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miles of Suez. Otherwise the channel is straight; and with the exception of about 2 miles on the eastern side of the canal at the south end of Lake Ballah, nearly the same distance on its western side at the southern extreme of Lake Timsah, as well as throughout the whole extent of the three Lakes, there is a solid dry embankment, varying in height from about 5 to 10 feet in the flat part to 50 or 60 in the higher portions.

18. Throughout Lake Timsah, and from where the embankment terminates at the north end of the Great Bitter Lake to the Lighthouse at the north end of the lake, a distance of about 1½ miles; also from the Lighthouse at the south end of the lake, throughout the length of the Little Bitter Lake, to where the embanked Canal again commences, the deep channel is marked by conspicuous iron beacons on either side; these beacons are 250 feet apart, and the deep water channel between them is the same in width as in the rest of the Canal; but in practice it is found more difficult to keep in the centre while passing through these beacons than it is when between the embankments.

19. The iron pile lighthouses at the north and south ends of the Great Bitter Lake are 8 miles apart, and visible the one from the other. In the space intervening, the water is two or three feet deeper than in the Canal; and ships are not therefore obliged to follow any direct course through the lake, but may proceed or anchor as convenient.

20. At every 5 or 6 miles between Port Said and Lake Timsah—the whole distance being 42 miles—there is a *gare* or siding to allow large vessels to bring up in either for the purpose of passing each other, or to moor for the night. These *gares*, which are temporarily marked by posts driven into the banks, are merely extensions of the width of the floor of the Canal under water, and are not sufficiently capacious, but they will, it is stated, be enlarged. That at Kantara, 24 miles from Port Said, is exceptionally large, and can accommodate three large vessels.

21. The pilots are of course well acquainted with the positions of these sidings; there is, or is to be, a telegraph station established at each of them, with a competent nautical official who is to regulate the movements of passing vessels, according to directions which will be communicated by telegram from Port Said, Ismailia, or Suez. Telegraph wires are established throughout the length of the Canal.

22. The best stopping places for ships after nightfall, and during sand-drifts, or high winds, when the passage of the Canal would be

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attended with risk of grounding, are the Kantara *gare*, Lake Timsah, and the Great Bitter Lake, which are respectively 24 miles, 42 miles, and 56 miles from Port Said. Lake Timsah at present has not more than 21 and 22 feet of water; and with a long ship some difficulty is experienced in entering the channel of the Canal from the lake; a sufficient portion of the lake is to be improved to render it a convenient stopping place.

23. Such, then, is the present state of the Canal. The second clause of our instructions, respecting the works proposed to be carried out in connexion with it, is now to be considered.

24. From M. Guichard, the chief authority on the spot, we learnt that when the Company took over the works from the contractors, they were quite aware of the weak points detected by us in our examination, and decided on completing the undertaking themselves, for which purpose, and also to maintain the Canal in a navigable condition, eight powerful dredges, and a proportionate quantity of mud-hoppers and other plant, have been permanently retained.

25. It was intended to proceed immediately with the improvement of those points to which we have alluded as faulty, by reducing the sharpness of the curve at El Guisr, widening it and the other three "curves of danger" to 130 feet at the floor of the Canal, and making the channel from the entrance of Port Said to the inner basin 30 feet deep, as well as increasing its width. In effecting the improvement of the curves, it is computed that about 451,000 cubic yards of excavation will have to be made, and a further removal of 1,100,000, it is said, would go far to perfecting the Canal, but the latter, being regarded by the Company as unnecessary for the actual requirements of navigation, is not likely to be undertaken at present.

26. It is also intended to mark the banks of the Canal by conspicuous beacons at every mile, instead of by the temporary kilometre marks which now exist only between Port Said and Lake Timsah. At every cable's length, or tenth of a mile, substantial pillars or bollards, for securing ships and heaving them off, are to be embedded in the banks on both sides; and the limit of 16 feet depth of water is to be marked on either side by buoys at a distance of a fifth of a mile from each other, or 400 yards apart, these buoys to be moored with a chain and sinker, and further secured by a second chain to the pillars on shore. We were assured that these pillars and buoys were being prepared at Trieste, and within four or five months would be in their places; if so the advantages and convenience to passing vessels will be

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considerably increased, for the great drawback at present is the want of appliances for heaving a vessel off of the ground, or of making her fast should it be necessary to stop.

27. It is expected that the whole of the improvements above mentioned will be completed by the close of the present year, the more especially as we have been informed by M. Lesseps himself, subsequently to our visit, that there is not to be any delay in commencing them.

28. Having thus described the Canal proper, there remains to be noticed the Mediterranean entrance at Port Said, to which the greatest importance has been attached by all the authorities who have considered the whole question; and, indeed, on no point has there been entertained a more general diversity of opinion than on the practicability of maintaining this artificial harbour.

29. The greatest difficulty anticipated by those who were well qualified to form an opinion was, that the large quantity of deposit constantly being carried eastward from the Nile would rapidly pile up against any artificial barrier that might be constructed, and form a shoal across the entrance of the Canal, through which it would not be practicable to keep a ship channel open: and on the correctness or otherwise of these views of course depended the success of the undertaking. M. Lesseps, however boldly confronted the difficulty, and his decision has been justified by the event. That the operations of nature have in some degree—indeed, to some considerable extent—produced the result anticipated, is not to be denied, as will be evident from an inspection of the plan of Port Said, which accompanies this report; but it is quite manifest, from the rate at which the accumulation of sand is taking place, as shown by the periodical observations of the French engineers, and by our own examination, that any practical inconvenience to navigation from this cause may be considered as remote; but if at any future time it should arise, the remedy is sure and simple, *viz.*, an extension of the breakwater.

30. Port Said, though affording sufficiently good anchorage for small vessels, cannot be considered a harbour, either in respect of extent or depth, for vessels of large tonnage and great draught of water. It is formed by two rough, narrow, and low breakwaters, of unfinished appearance, enclosing an area of some 450 acres, with an average depth of only 13 or 14 feet of water, except in the ship channel leading to the inner basins, where the depth is from 25 to 28 feet.

31. The western breakwater, which extends for 6940 feet at right

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angles to the shore, and is slightly curved to the eastward towards its extremity, was commenced in 1860, and carried out about 1300 feet, beyond which point, and at a short distance from it, was deposited a heap of stones that was surrounded by iron piles, and from its detached position, was called "The Island." The work was then left untouched till 1866, when the breakwater was joined to the Island, and it was continued to its present length, and finished in 1868. From the mainland to the Island the breakwater is formed, on its inner side, of a bank of rubble stones, surmounted by a promenade, over which the spray breaks with a very moderate N.W. wind, and on the outer or sea front of concrete blocks, but beyond the Island to its termination it is entirely constructed of large blocks of artificial stone, composed of one part of French hydraulic lime with two parts of sand, and some of which were transferred to it from the eastern breakwater. This latter, which is also constructed of large masses of concrete, is of more recent construction; it extends about 6020 feet, and converges towards the western breakwater.

32. Both structures are deficient in width, and from the rough way in which the blocks are deposited some amount of silt finds its way through the interstices, while from their slight elevation the sea, during fresh N.W. winds, washes over them, bringing with it a certain quantity of sand.

33. It is said, and probably with truth, that it is only during strong winds that the silting up occurs through either cause, to any extent. That the current does not always run to the eastward, but after easterly winds in the contrary direction, is evident; and at the inner part of the eastern breakwater, where some of the blocks were removed for the purpose of completing the outer portions, thereby leaving a breach, the effect of an easterly current or an easterly wind is plainly to be seen in the sand accumulated.

34. From an examination of the French plans, and by our own measurements, the shore has extended seaward along the outside of the western breakwater since 1860, or in ten years, 1220 feet; the action of the current has thus reclaimed, in that period, in an angular form, an area of about 45 acres. An inspection of the French diagrams shows that this process of silting has not been uniformly progressive; during some periods, indeed, it has been stationary. The area included within a line drawn from the eastern end of the breakwater to the tangent of the beach line, about 3 miles, to the westward, is 1400 acres, and from this some idea may be formed as to the remoteness of the time when any practical inconvenience to the harbour will result through the process of silting.

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Two proposals have been made for obviating the influx of sand through the western breakwater into the ship channel; one being to cut parallel with the breakwater a small trench into which the sand would fall as it came through, the other to dredge the channel so as to keep it always at 9 metres or 28½ feet in depth, and this it is considered could be accomplished by the employment of a dredger for thirty days in every year.

35. It will thus be seen that while there need be no apprehension of difficulty in keeping open the ship channel by either of these methods, or by the improvement of the breakwaters—which, however, appear to answer the purpose for which they were designed, *viz.*: to afford shelter to the inner basins and Canal—there is no obstacle to the formation of a deep water harbour in the Avant port, which may be dredged to any depth; but it is doubtful whether such increased depth would be an advantage, as the sheal water protects the inner basins from the sea.

At present a deep channel only, which, as before observed, is to be widened and deepened to 29 or 30 feet, has been opened for the passage of ships; it is not sufficiently buoyed for vessels entering without the aid of a pilot, but will be improved in this respect.

36. South-west gales are the heaviest on this coast, but being off shore, they produce no sea. N.N.W. and N.W. are the prevailing winter winds, but they are not often heavy, and the breakwater affords protection from them. The summer winds are N.E. which is right into the Port, and though they seldom blow with great strength, yet they generally send in sufficient sea to prevent dredging operations. November is said to be the quietest month, and it is calculated that the dredging already alluded to will always more than suffice to ensure the necessary depth in the channel of Port Said. During our stay in February, a strong N.E. wind set in, on one of the mornings on which we went out in the steam tender to examine the entrance: it is probable that a vessel drawing 23 feet of water, would on this occasion have touched the mud with her keel; this breeze was, however, but of a few hours' duration, and the same strength of wind would probably have prevented a vessel of similar draught from entering the harbour of Alexandria.

From this and subsequent examinations it appears quite certain that no shoals have been formed, and no decrease has taken place in the depth of the water near the pier ends since the completion of the breakwaters.

37. It may be well to mention here, that the shoal on which two

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of our iron-clad ships grounded, on the occasion of the opening of the Canal, was entirely caused by the deposit of the soil dredged from Port Said; it is shewn on the chart, and the marks for clearing it sufficiently described in the nautical directions.

38. There is a small light exhibited on each of the pier ends: Port Said Lighthouse itself stands at the inner entrance of the western breakwater. It is a grey-coloured octagonal-shaped tower, constructed of concrete, 180 feet high, exhibiting an electric light visible at a distance of 25 miles, and it forms a noble beacon by day or night.

39. The inner basins are spacious, occupying an area of 137 acres, with a depth of 27 feet; they can be dredged at all times without difficulty, and are capable of indefinite extension either on the western or eastern sides, especially on the latter, where they would be even more sheltered than the present western basins.

40. The port of entry at the Suez terminus is easy of access. A breakwater protects the Canal entrance from southerly winds, and a basin is in progress of construction by the Company. The Egyptian Government works at Suez are likewise extensive; they consist of a dry dock, 416 feet long, with a width of entrance of 78 feet, and a depth over the sill of 22 feet. The "Forte," one of our largest frigates, and the "Jumna," one of the large Indian transports, have lately been docked there; there are also two capacious basins, a naval and a commercial one: the former is nearly finished, and admits the largest ships of the Peninsular and Oriental Company to lie alongside, with a draught of 21 feet 6 inches; a single dredge, in a few days, would render it available for the Indian transports. The Commercial Basin is in a less complete state, but will probably be finished in the course of 12 months, when nothing will be left to be desired in respect of basin and dock accommodation at this place.

41. There is steam communication between Port Said and Ismailia daily, and railway from the latter to Suez: leaving Port Said at 7 a.m. Suez is reached between 6 and 8 p.m.; there is also a direct line of rail between Ismailia and Cairo, and the journey occupies about 6 hours; punctuality, however, is not to be depended upon. At the town of Zagazig where the cultivated part of the desert may be said to commence, 40 miles west from Ismailia, and about the same distance north of Cairo, is the Alexandria Junction of the line.

42. The fresh water Canal between the Nile at Cairo and Ismailia was completed in 1862, and connected with the mari-

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time Canal by means of two locks at Ismailia, and a short junction to the north end of Lake Timsah. About 3 miles before reaching Ismailia an arm of this fresh water Canal branches off and follows nearly the line of rail and maritime Canal, to Suez. Since the completion of this great work there has been an easy and abundant supply of fresh water throughout the length of the Canal, which was formerly only scantily supplied by the constant labour of about 1000 camels. The northern portion of the Canal, between Ismailia and Port Said, and the town of Said itself are supplied from Ismailia, the water being forced by steam machinery through a double row of pipes along the banks of the Canal. The depth of the fresh water Canal is about 4 feet, and it has been once emptied and cleaned out during the 8 years it has been in existence.

43. The general questions now to be considered are those regarding the permanence of the Canal works; and the comparative advantages which it will confer on navigation.

44. Most of the physical difficulties which it was anticipated would operate prejudicially on the Canal, if not altogether bar it as a navigable channel, have certainly proved to have been fallacious. The difference of level of the two seas, so far as it has had any effect in producing a current one way or the other, is inappreciable: the tidal observations which we were able to make were necessarily somewhat imperfect from want of time, but they were made at that period of the moon's age, when their effect would be greatest; the results shew that in the southern portion of the Canal between Suez and Great Bitter Lake, the tidal influence from the Red Sea is felt, there being a regular flow and ebb; the flood running in for about 7 hours, and ebb running out for 5 hours; at the Suez entrance, the rise at springs, unless affected by strong winds, is between 5 and 6 feet; about half way from Suez to the Small Bitter Lake, a distance of 6 miles, it is under 2 feet; at the south end of the Small Bitter Lake, a few inches only, while at the south end of the Great Lake there is scarcely any perceptible tidal influence. We were informed by the authorities at Ismailia, that since the Great Lake has been filled, the level of Lake Timsah, which was filled from the Mediterranean in April 1867, has risen 12 centimetres, or about 4 inches: and that its waters are continually running at a slow rate into the Mediterranean; certainly this statement agreed with what we ourselves remarked, for we always found a current running northward from Lake Timsah, at the rate of from $\frac{1}{2}$ a mile to a mile an hour. Limited however as these tidal observations were, they were taken with great care and appear sufficient to show that except at the Suez end, the tides will not materially affect the passage of vessels; at that end, therefore, large vessels must regulate their time of passing; indeed the greatest difficulty which

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will be experienced will be not from the tides, but from the prevailing North East wind in the Canal, which will make close steerage difficult in going from North to South.

45. With regard to the question of evaporation, it is impossible to say that a hot summer will produce no appreciable effect on the water of the Great Lake, but it may be fairly predicted, that no serious effect will result, sufficient to produce a disturbing influence on the general conditions of the Canal, and thereby affect its navigation.

46. The doubts as to the practicability of keeping the Mediterranean entrance open have so far been dispelled by experience, and may, it is believed, be dismissed altogether. As to any difficulty of approaching Port Said by steam ships, under ordinary circumstances there is none; the coast is very low, but the masts of the shipping and the high lighthouse are conspicuous marks at a good offing, and it is only necessary to bring the latter on the bearing pointed out and steer for it. It is certainly not recommended to enter at night, unless with the aid of a pilot and under exceptionally favourable circumstances, or with a small vessel whose draught would permit her to anchor between the breakwaters, nor would it be prudent to run for the port in a gale blowing on shore; in this respect indeed Port Said may be considered under the same conditions as Alexandria, there is neither more nor less danger in the one case than the other, and in either there is sufficient sea room. Although the Canal itself will not be used by sailing vessels, it is probable that such vessels will frequent Port Said, and there is no reason why in moderate weather they should not enter the inner basin; with westerly winds, however, great care must be observed not to be set to leeward or on to the east bank, or to miss the port, and with contrary winds steam tugs will be necessary; in moderate weather the anchorage outside is safe; but it is strongly recommended that sailing vessels should not approach the port, in weather which would render the anchorage outside unsafe.

47. The impression which generally prevails that the navigation of the Red Sea is difficult and dangerous, is to a great extent erroneous, as will be readily admitted by those practical navigators who have had most experience in its waters; undoubtedly the Gulf of Suez which extends for 160 miles to its junction with the Red Sea at the Strait of Jubal is difficult navigation for a sailing vessel, and requires strict care and attention even with the aid of steam; but as its width is in no place less than 6 miles, and in most parts as much as 10, and free from any serious current disturbances, except when in close proximity to the shoals in the Strait of Jubal, it will be evident that if

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correct courses are steered, and proper precautions observed, there should be no risk of accident. The greatest difficulty experienced by a stranger is in judging his distance from the shore at night, owing to the high land lying so far back from the actual low coast line, and the peculiar haze which frequently prevails. Nor is the Strait so well lighted as it should be, but it is believed, that His Highness the Viceroy is prepared under certain conditions to remedy this latter difficulty, and at an interview with which he honoured us at Cairo, His Highness was pleased to grant his ready assent and assistance to enable an examination to be made of certain points in the Gulf—an examination which Capt. Grant, R.N., then in the Red Sea, was good enough to undertake The result is, that Ras Gharib, a prominent point on the western shore of the Gulf, about 100 miles from Suez, and 47 miles south of the present light on Zafarana point, may be considered a very eligible position for a light-house, and as there is an iron one with a complete lighting apparatus lying at Suez, it is to be hoped that steps will be taken for the establishment of a light on this point.

48. There is no doubt, moreover, that a more modern and detailed survey of the Gulf of Suez is necessary now that it has become so great a highway for the ships of all nations, and especially for our own. At the same time it is to be observed that the large steam ships of the Peninsular and Oriental, and other Companies, and our still larger Government transports have long frequented this route in security by day and night.

49. In regard to the Red Sea proper—although from the circumstance of the winds generally blowing either directly up or down, and in consequence of frequent calms, its navigation must always be difficult and tedious for sailing vessels, it cannot be said to be dangerous. From the Island of Shadwan, at the southern end of Jubal Strait, to the Strait of Babel Mandeb, where the Red Sea enters the Gulf of Aden, is a distance of nearly 1,100 miles, and the average width is about 80, until within the last hundred miles, when the channel becomes encumbered by islands; but there is in no part a passage of a less navigable width than 11 or 12 miles. But few dangers exist in the centre of the sea, and there is everywhere a navigable channel of not less than 40 miles wide, entirely free from them. Still it would add to the convenience of navigation and give confidence to the seaman if it were better lighted. There is a good light at present on the Dædelus Shoal, which is nearly in mid channel, 180 miles from the Strait of Jubal. The Brothers Islands, which lie in a direct line, and almost intermediate between these points, offer an excellent site for a second light. A light is also much required at Mocha, 40 miles northward of

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the Island of Perim, at the entrance of Babel Mandeb Strait, on which there is already a good light. The light at Mocha might be a floating one, and if another lighthouse were placed on one of the small islets, just east of Jibbel Toogur and 50 miles northward of Mocha, the Red Sea might be considered as fairly lighted.

50. If these views are adopted, views it may be stated concurred in by Capt. Grant, R.N., and generally approved by Captain Curling, R.N.R., of the Peninsular and Oriental Company's Service, an officer of great experience in the navigation of the Red Sea—four additional lights will be required, and it is strongly urged that no time should be lost in establishing them.

51. Having now dealt with and disposed of the difficulties, some real and others visionary, that have been anticipated, one other remains, and that is, not whether the Canal can be kept open and maintained with comparative ease and little annual cost, but whether the passage by large ships may not at times be checked and delayed.

52. But before discussing this, having formed the opinion that its maintenance would not be a matter of so grave a character as has been predicted, we will state our reasons for arriving at such a conclusion:— A careful examination of the Sweet Water Canal which runs for many miles parallel to and through the same soil as the Maritime Canal showed that during the seven or eight years since its formation, though it has been once cleaned out, its section has been but little affected either by the erosion of its banks from passing vessels, (and the traffic on it is very considerable,) or by any large deposit of sand drift from the desert. With reference to the former, we found that from the nature of the soil, and this of course applies to that of the Maritime Canal, which contains lime in large quantities, the banks below and a little above the water become hard and encrusted, and the ordinary wave or wash from a passing vessel, going at moderate speed, disturbs the surface but little, if at all.

53. Observations in the Maritime Canal showed the same results, more especially where the banks were steep and on a good incline, for there it was noticed that as the wave rose and fell, the water coming off them was not discoloured, nor did it bring back with it any sand or mud; but along those portions of the Canal where on either side wide berms or horizontal benching have been left a little above or below the surface level of the water, considerable agitation of the soil took place, particularly when the vessel proceeded at a speed exceeding four knots, and

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the wave rolled off the banks heavily charged with the detritus of these berms, and much discoloured.

54. We regard this in point of construction as the least favourable feature of the entire work, and though in time, when the banks shall have assumed their natural sections, this disturbance may cease, yet till then, some little silting, necessitating continuous dredging operations to keep the centre of the Canal to its normal width and depth, will be the result. Through these parts of the Canal, as indeed throughout its entire course, except in the larger Bitter Lake, the speed should never be permitted to exceed 4 or 5 knots per hour, a rate which under all ordinary circumstances, ruling the transit of a ship from sea to sea, is sufficient to ensure correct steerage.

55. Even were it advisable, the great cost and tedious nature of the operation of pitching the banks with stones, which to be at all effective would have to be carried below the line to which a ship in passing forces the water to recede, now that the Canal has been filled, precludes the idea of its being even suggested by us. When we use the word pitching, we mean lining or covering the banks with stone fairly dressed and carefully jointed, cramped and set in cement or hydraulic lime: any other method would be useless and indeed a source of mischief, as is apparent from the destruction of the rough pitching or deposit of stone, which has been placed along some parts of the African bank for the protection of the line of pipes conveying fresh water from Ismailia to Port Said.

56. The very insignificant decrease in the depth of the Sweet Water Canal since its construction leads us to hope that the apprehensions of deposits in large quantities of fine sand from the Desert have been much exaggerated, and we were assured by those who professed to have examined the subject that the drift sand usually passed over and not into the Canal. Indeed, at the special points where the Maritime Canal can be affected to any great extent from this cause, and which are limited to the Seuils d' El Guisr, de Sérapéum, and Chalouf-el-Terraba, its passage is through comparatively deep cutting with spoil banks above the Desert level, which have a tendency to check the drift, and by creating currents, possibly of lower temperature and of but slight force, at right angles to the direction of the prevailing drift, prevent the sand from falling.

Further, the direction of the prevailing wind is up and down the Canal, and this, even when blowing strong, causes little drift; but a

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south west wind which on one occasion blew stiffly for a few hours caused an accumulation of sand on the ship's deck of $\frac{1}{16}$th of an inch in thickness.

57. We proceed, then, to the consideration of the question of how far the Maritime Canal is likely to answer its object, what difficulties may be anticipated in its navigation, and to what extent it may be expected to be useful for the purposes of Her Majesty's naval service, including the transport service to and from the East.

58. For all steam ships, or vessels towed, ranging between 250 and 300 feet in length, with 35 feet beam, and a draught of 20 feet, it will, with the improvements and appliances earlier described, be a convenient highway. It may, therefore, be assumed that, with the exception of the iron-clad ship at present stationed in the East, or any unusually heavy vessel, it will be a channel available for the passage to and fro of our Indian and China squadrons.

59. The maximum speed should never, except in the large Bitter Lake, exceed five miles an hour: this rule should not at any time be departed from, not only to prevent injury to the Canal by the disturbance of the soil of the banks which greater velocity would occasion, but also to avoid accident to the vessel from striking the ground heavily, as she might do if she touched when going fast, which in the case of a propeller might entail serious damage to the screw.

60. All vessels should be steered from the bridge, the pilot being alongside the helmsman, and those of the smaller class should, when approaching or passing each other, reduce their speed or stop, the width of the Canal enabling them, by careful steering, to keep in deep water.

61. For the transit of vessels larger than those described, the Canal is not so well adapted, and special arrangements, such as are observed on a single line of railway should be made and enforced.

The extreme length of such vessels would prevent their passing each other, except at a station; for any unfavourable circumstance—such as even a moderate wind astern, which would cause a ship to yaw as much as a quarter of a point off her course, would probably place her on shore before she had time to recover her steerage; and, as there is no rise or fall of tide to float her off again, would necessitate lightening her very considerably, a process, it is needless to say, attended in a merchant ship with inconvenience, and likely to involve the blocking up

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of the Canal, causing delay, perhaps of several days, to herself and other vessels.

The question of the present Indian Transports passing through the Canal with troops demands serious consideration; and there are so many points involved, that it is difficult to offer any decided recommendation.

62. That these vessels which were built for an entirely different service, and are about 400 feet long, with a draught of 22 feet water, and beam of nearly 50 feet, can pass through the Canal, is undeniable; but no practical seaman need be told, that in steering them through what may be called a continuous dock 90 miles in length, less than 100 feet wide, and with nothing showing above water to mark the centre of it, frequent grounding and consequent delay may be anticipated, though every possible care and precaution be taken. The extreme dimensions of these vessels, combined with the great height of their hulls, upon which the effect of even a moderate breeze in any other direction than right ahead must be very prejudicial to exact steerage, would increase the difficulty of the passage. It is to be considered, also, that the mid-ship section of one of these vessels bears about an average proportion of 1 to 4 to a section of the deep water part of the Canal; she would consequently displace about a quarter of the water in it, and, if moving above very slow speed, considerably reduce the depth of water underneath her.

63. As regards the advantages which the Canal will offer to the national and commercial interests of the United Kingdom over the present route to the East by the Cape of Good Hope, two questions arise—the first, to what portions of the globe and to what class of vessels will it offer advantages; the second, what will be those advantages in point of time and money. The answer is, that India, China, and the Eastern Archipelago are the portions of the globe which will be specially affected; and to a certain extent Australia and New Zealand also; and that the class of vessels which will be exclusively benefited must be those with steam power, for the special reason that a part of the Mediterranean and the whole of the Red Sea, owing to the character of the winds, must be considered as essentially steam navigation. The class of steam vessels which have to be separately considered are—

(1) Ships of war employed on the India and China Stations.

(2) The Mercantile Marine.

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(3) The Troop Service between England and India, either as carried on by the present Indian transports, or by any vessels which may in future be designed.

(4) The great lines of steamers carrying mails, passengers, and merchandize, such as the Peninsular and Oriental Company's vessels.

64. In considering these questions it is necessary to select some point as a standard of comparison in point of distance common both to India and China; that is, a point which vessels bound to either country must pass either near to, or in its meridian; and for the purpose we select Point de Galle.

	Geograph. Miles.
The distance from the English Channel (Start point) to Galle by the Canal is	6,515
By the usual sailing route round Cape of Good Hope it is	11,650
The difference in favour of the Canal route is therefore	5,135

and this advantage may be considered as an equivalent, in point of time, to 36 days. A ship of war bound to India or China, by the present route, generally calls at the Cape de Verde Islands and the Cape of Good Hope, and in the case of China at Singapore to replenish her fuel, &c.; by the Canal she would call, perhaps at Gibraltar, certainly at Malta, at Suez, and Aden, and if going to China, at Singapore, for the same purpose; and it may be safely assumed that she would use one third more coals before reaching either station by the Canal route, irrespective of the dues for passing through, which will be considered presently.

65. The mercantile marine may be considered under nearly the same conditions as ships of war, so far as the saving of time is concerned; but their condition being changed from sailing to steam vessels, the whole amount of fuel expended must be taken into account, as well as the loss of carrying power consequent on that change; the shortening of the voyage to China, however, by about 36 days, combined with the advantage of submarine telegraphy, will certainly far more than compensate for these drawbacks, and it is not to be doubted but that the Canal route will prove highly advantageous to a class of vessels constructed especially for its navigation.

66. Under the present system of transport, 48 hours are occupied

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from the time of arrival at Alexandria to that of embarkation in the Red Sea, in carrying the troops by rail across the Isthmus of Suez, and it appears to us a reasonable calculation that by the Canal route an average delay of 3 days might be expected, from the date of arrival of one of these ships on the Mediterranean side to that of her departure from Suez. Thus, then, it seems that, as regards time, the passage through the Canal would not effect any saving, but if the adoption of that route, with a different construction of vessel, would lead to the reduction of one ship out of the five now employed, and abolish collateral expenses as well as the inconvenience of two transhipments of troops and baggage, it will certainly be worthy of consideration, and, leaving the political bearing out of the question, becomes a matter of expense only, which can easily be calculated.

67. The great lines of mail and passenger steamers, such as the Peninsular and Oriental, come nearly under the same conditions as the troop ships, except in the carrying of merchandise. They would probably land their mails and passengers at Bombay a day or two later by the Canal route, than under existing arrangements, but they would save transhipment of cargo, and might possibly be able to reduce the number of their vessels; moreover, although the vessels of the Peninsular and Oriental Company are not precisely the class of vessel best adapted to navigate the Canal, yet in this respect they enjoy a great advantage over the present Indian troop ships. The solution of the question as regards these Companies is, that it will probably be found advantageous at present, to adopt both the overland and the Canal routes.

68. Any estimate of the comparative cost of the Canal route and the overland transit, or the long sea passage, must of course be based on the present tariff of charges adopted; in this respect no decisive information could be obtained on the spot, as to what they will ultimately be fixed at; probably because the Company's officers were unable to afford it. A doubt existed as to whether the dues would be charged on builders' measurement or register tonnage, which has since been decided in favour of the latter: it was uncertain also whether troops passing in ships of war would be considered as passengers. At the present time, however, there are three separate charges levied, *viz.*—

10 francs per ton, on register tonnage, or exclusive of space occupied by engines and coals.

10 francs a head for passengers.

20 francs per decimêtre (4 inches) for vessels over 20 feet draught as a pilotage charge.

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Therefore, the charges for one of the present Indian transports, taking the register tonnage at 3,002 tons, and drawing 20 feet, which she would probably do in passing through the Canal, would be—

Registered tonnage . . .	£1250
For 1200 troops, considered as passengers	480
Pilotage	50
Total . .	£1780

as against the present charge for overland transit, which is believed to be between £1600 and £1700.

For a vessel of the Volage class, the register tonnage of which is 852 tons, the charges would be—

Register tonnage	£355
Pilotage on 20 feet draught . . .	50
Total . . .	£405

69. Therefore for a ship of war of the latter description and tonnage, adding £500 for the extra coal which would probably be consumed, there would be £895 to be placed against a saving of 36 days on the voyage to India or China, leaving out of consideration the wear and tear of a voyage round the Cape of Good Hope; taking these figures as a basis, it would probably be considered desirable to send all small or moderate sized vessels through the Canal.

70. Keeping, then, in view what has already been said with regard to the physical character of the Canal, and what has now been assumed as to its economy, the preponderance of opinion is against the use of the Canal as a highway for our present type of transports, but it appears certain that by a different construction of vessel, and without any increase in the number, that object could be accomplished with ease and convenience.

71. This is an opinion which of course may prove fallacious. For the reasons assigned, however, it does not seem advisable that any change in the present system of moving troops between this country and India should be decided on, before the commencement of the season of 1871; by that time there will be positive experience on which to base a decision, especially if the passage through of the "Jumna" should be determined upon; and if our anticipations prove correct in regard to the works still to be carried out, the Canal will be in a far more perfect condition then than it is at present.

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72. We have thus, in accordance with our instructions, considered in detail the present condition of the Suez Canal, and the works to be carried out in connection with it, as well as the probability of its being available for the purposes of H.M.'s Naval and Transport Services, and have arrived at the conclusion—

1. That for a certain class of vessels this great work, which must always be a monument of persevering energy and engineering skill, as it now stands, is a convenient mode of passage from the Mediterranean to the Red Sea.

2. That it will be so to a greater extent when the works contemplated, *viz.*, the deepening of certain shallow parts, the enlargement of the *gares*, and the widening and improvement of the curves, are carried out.

3. That it is available for the transit of ships employed in the eastern seas, with the exception of the large iron-clads, and other exceptionally heavy vessels.

4. That for the present type of Indian transports it is not a desirable route.

5. Further, we think that the cost of maintenance will not exceed the amount estimated for it when the work was first projected.

73. We would now briefly advert to the prospects of the Canal as the grand highway for the naval and mercantile marine of Europe to the East. The real drawback to the Canal is its narrowness, and we were informed that, except at the parts mentioned previously, it is not the intention of the Company to give it the additional width, the want of which alone prevents its being pronounced a complete success as a permanent navigable route for the largest ships from sea to sea.

Had its width at floor been doubled, with a proportional increase to its surface, it might now have been fairly regarded in that light, and its maintenance would have been comparatively easy, just as a great city thoroughfare is periodically renewed by having one-half of its width blocked up; whereas, by closing one half of the Canal as it now stands, the other would be rendered practically impassable to large ships, and some expedient must therefore be resorted to, such as carrying on the repairs by night, or leaving the passage open to ships for certain periods only during the day.

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74. That to increase the width of the Canal would be a perfectly feasible undertaking, the cost of which could be calculated with great accuracy, need scarcely be asserted; it is, however, we understand, very improbable that it will be undertaken by the present Company, and that it may eventually become a national or combined international engagement is a question which, depending as it must do on political and other considerations, it would be out of place to discuss here.

75. We cannot conclude this report without expressing the obligation we feel under to M. Guichard, the chief authority, in the absence of M. Lesseps, and to every one of the officials of the Company with whom we came into contact, for the frank and unreserved way in which they placed all the information in their possession at our disposal.

We have great pleasure, also, in acknowledging the zealous and effective aid we received from Captain Nares, Mr. Tizard, the navigating lieutenant, and the other officers of H.M.'s surveying vessel, "Newport," which vessel was placed at our disposal by their Lordships during the time we were employed on this service.

GEO. HENRY RICHARDS.

AND. CLARKE.

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List of Ships which have passed through the Suez Canal, from the date of its opening, up to 10*th February,* 1870.

FURNISHED BY THE ENGLISH CONSUL AT PORT SAID.

Date.	Name.	Tonnage.	Length in Feet.	Breadth in Feet.	Draught forward.	Draught aft.
27th Nov., 1869	Brazilian	1809	380	35	17.8	20.6
1st December.	Lin Nanzig	722	224	32	12.0	13.3
1st ,,	Queen of the South	1377	255	39	16.0	17.5
12th ,,	Danube	561	216	27	11.9	11.9
24th ,,	Stirling	762	231	28	13.6	15.10
27th ,,	Malta	616	213	30	13.0	16.0
28th ,,	Rocket	17	85	17	7.0	8.9
30th ,,	Leith.	957	290	35	16.6	17.6
31st ,,	Fox	224	216	22	6.0	7.6
31st ,,	Blue Cross	653	219	30	14.2	17.0
9th January, 1870	Mauritius	1341	261	39	16.4	18.0
9th ,,	Asie	475	225	30	14.3	15.4
9th ,,	Cleator	317	184	23	10.2	11.7
12th ,,	Sakana	196	132	20	10.6	12.0
13th ,,	Europe	975	285	33	14.0	17.3
16th ,,	William Miller	566	215	27	10.0	13.1
21st ,,	Marietta	93	70	22	6.6	9.6
22nd ,,	Shepperton	666	210	30	15.0	18.5
22nd ,,	Woodham	648	209	30	17.0	17.0
26th ,,	Calypso	1123	251	32	17.0	17.3
28th ,,	Arrow	139	120	20	8.0	8.6
29th ,,	Afrique	965	304	33	16.4	17.2
30th ,,	Waverley	388	190	27	11.6	14.0
31st ,,	Newport	425	170	25	10.6	11.8
1st February	Fire Queen	796	248	29	11.6	15.6
2nd ,,	Ebro	150	215	26½	11.0	13.0
3rd ,,	Shan-tung	907	216	39	9.0	11.2
3rd ,,	Liverington	1052	214	30	10.0	14.6
6th ,,	Apis	900	234	29	13.0	14.11
6th ,,	Gaffarich	507	230	28	15.0	13.0
7th ,,	Chu-Kiang	1007	206	30	14.3	15.3
7th ,,	Retimo	342	230	26	9.6	10.0
9th ,,	Assiont	400	184	45	11.0	12.6
10th ,,	Jeanne d'Acre	138	72	21	5.0	7.4
10th ,,	Zagazig	500	250	28	7.0	12.0

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List of Ships which have passed through the Suez Canal, from the 10th February, 1870, to the 7th March, 1870.

FURNISHED BY THE AGENT OF THE CANAL COMPANY.

Date of Transit.	Name.	Flag.	Nett Official Tonnage (exclusive of space for engine).	Draught.
				ft. in.
7th February .	Marietta . . .	Austrian (sail-ship) .	77	7 11
13th „ .	Caka . . .	Egyptian (steamer) .	930	13 „
15th „ .	Dido . . .	British „ .	$1062\frac{46}{100}$	17 „
15th „ .	India . . .	„ „ .	$686\frac{82}{100}$	14 6
17th „ .	Meinam . . .	French „ .	$939\frac{46}{100}$	19 4
20th „ .	Breadalbane . .	British „ .	$877\frac{06}{100}$	15 8
22nd „ .	Hotspur . . .	„ „ .	$714\frac{8}{100}$	16
22nd „ .	Spartan . . .	„ „ .	$916\frac{45}{100}$	17 2
22nd „ .	Head-quarters . .	„ „ .	$518\frac{87}{100}$	18 4
23rd „ .	Albatross . . .	„ „ .	$661\frac{37}{100}$	14 6
23rd „ .	Milbanke . . .	„ „ .	$843\frac{11}{100}$	17 „
24th „ .	Cordova . . .	„ „ .	$1064\frac{17}{100}$	16 „
25th „ .	Dongola . . .	Egyptian „ .	140	11 „
25th „ .	Brazilian . . .	British „ .	$1809\frac{61}{100}$	18 „
25th „ .	Bywell Castle . .	„ „ .	891	16 10
27th „ .	Africa . . .	Italian „ .	$488\frac{61}{100}$	17 10
28th „ .	Shandi . . .	Egyptian „ .	370	12 „
1st March . .	Europe . . .	French „ .	$975\frac{85}{100}$	19 „
1st „ . .	Danube . . .	British „ .	$561\frac{20}{100}$	13 6
1st „ . .	Vedetta . . .	Italian „ .	340	12 8
2nd „ . .	Robert Lowe . .	British „ .	$1277\frac{67}{100}$	19 „
2nd „ . .	Kaffraria . . .	„ „ .	$627\frac{43}{100}$	17 „
3rd „ . .	Hoogly . . .	French „ .	$1767\frac{97}{100}$	18 9
3rd „ . .	Erl King . . .	British „ .	$1068\frac{85}{100}$	19 8
6th „ . .	Snipe . . .	„ „ .	393	13 „
6th „ . .	Asie . . .	French „ .	$477\frac{28}{100}$	14 1
7th „ . .	Cszru . . .	British „ .	$293\frac{11}{100}$	13 7
7th „ . .	Massouah . . .	Egyptian „ .	325	8 „

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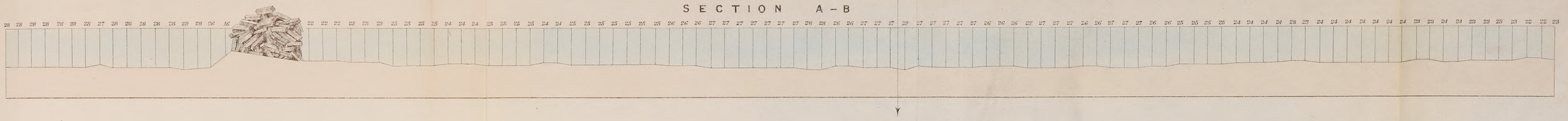
SECTIONS OF PORT SAÏD.

The Arrows denote the centre of the Channel.

WESTERN BREAKWATER.

SECTION A–B



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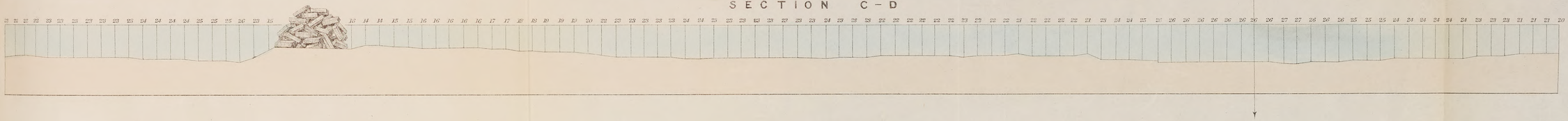

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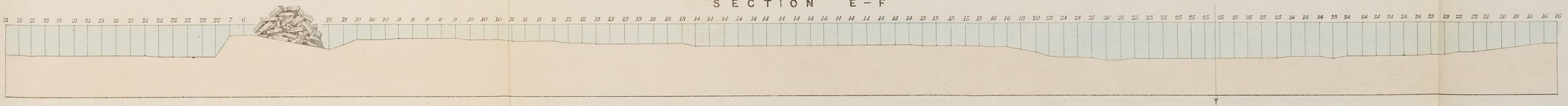

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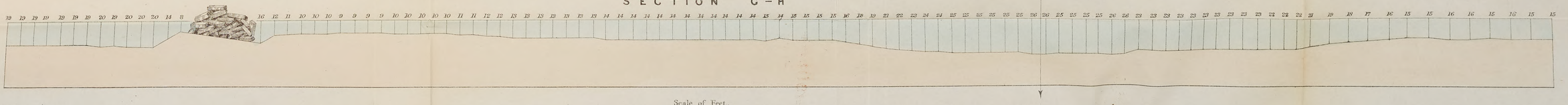

Scale of Feet.

0 100 200 300 400 500

Malby & Sons, Lith

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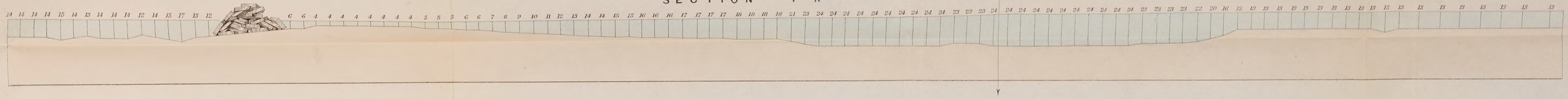
SECTIONS OF PORT SAÏD.

The Arrows denote the centre of the Channel.

WESTERN BREAKWATER

SECTION I—K



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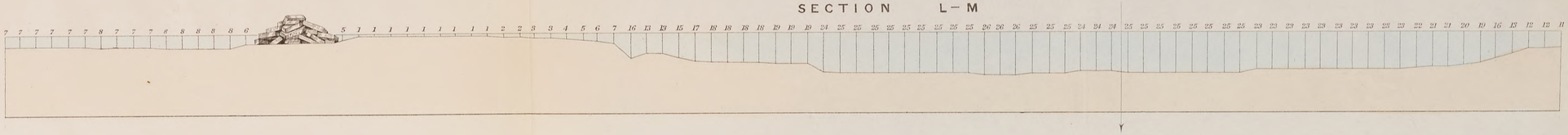
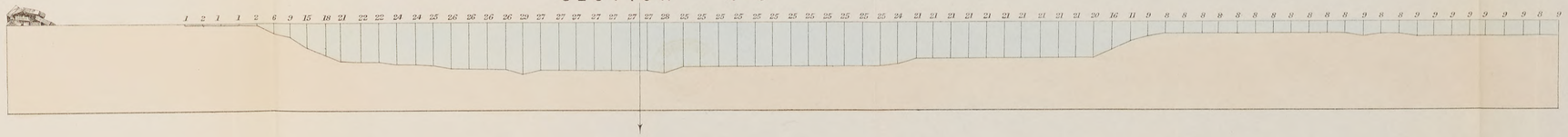
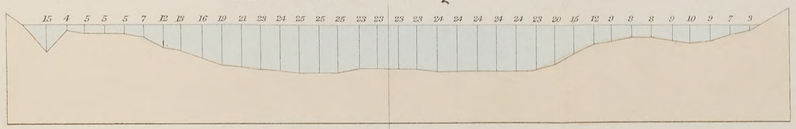


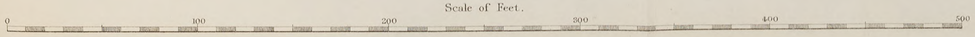
SECTION N—O



SECTION P—Q



Scale of Feet.



Malby & Sons, Lith.

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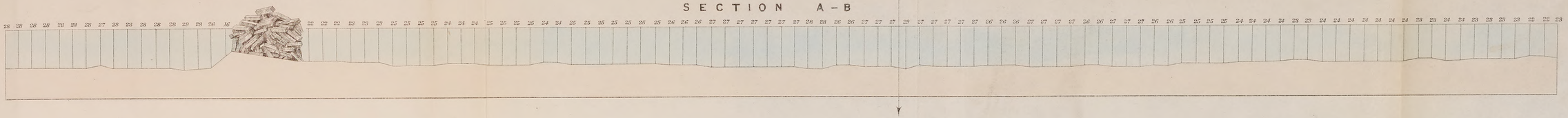
SECTIONS OF PORT SAÏD.

The Arrows denote the centre of the Channel.

WESTERN BREAKWATER.

SECTION A–B



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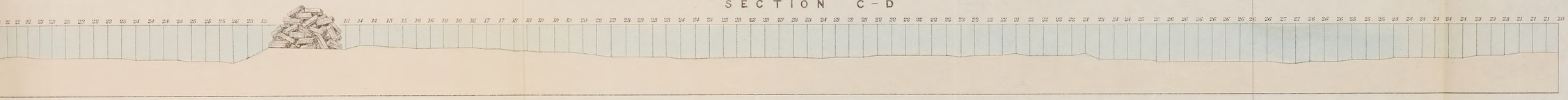

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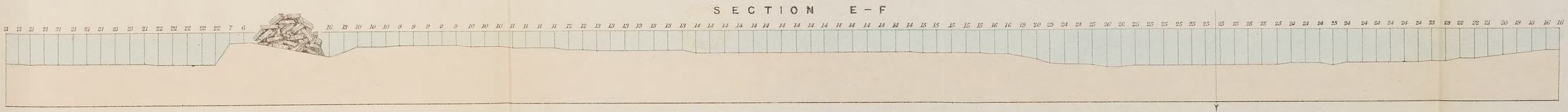

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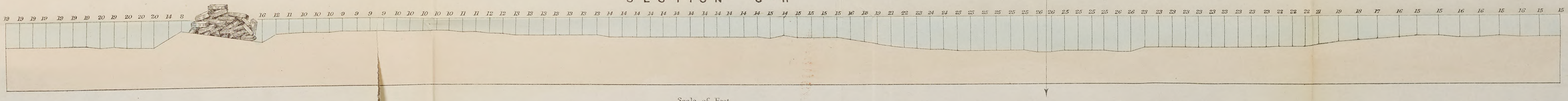

Scale of Feet.

0 100 200 300 400 500

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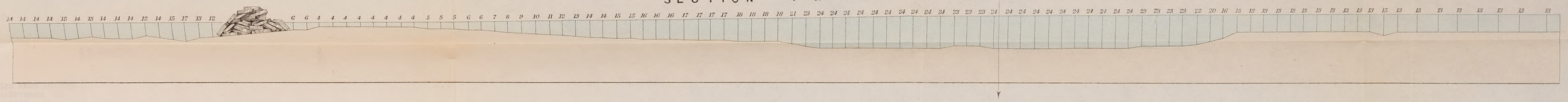
SECTIONS OF PORT SAÏD.

The Arrows denote the centre of the Channel.

WESTERN BREAKWATER

SECTION I—K



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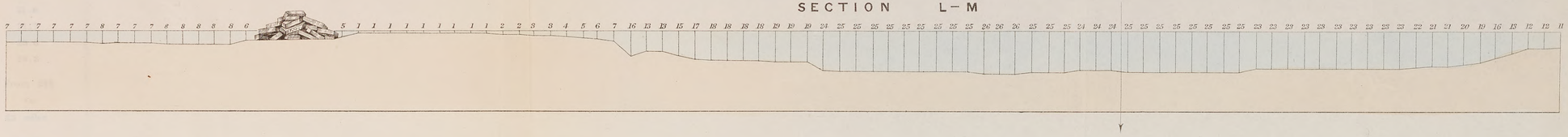
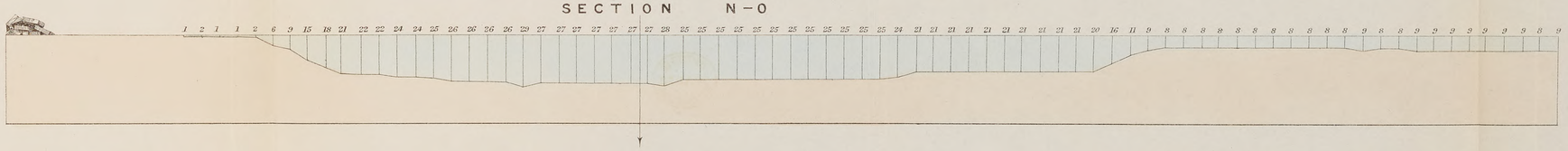
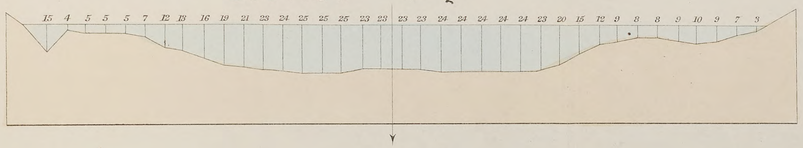


SECTION N—O



SECTION P—Q



Scale of Feet.

0 100 200 300 400 500

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INDEX TO SECTIONS.

NUMBER OF SECTION	MILES FROM THE HIGH LIGHTHOUSE AT PORT SAÏD	POSITION
1	1 .4	
2	4 .4	
3	8	At Ras el Ech
4	13 .5	At Gare
5	17 .2	
6	19 .	At Gare
7	21 .6	
8	21 .7	
9	23 .6	
10	23 .8	
11	From 24½	
12	to	
13	25 miles	At Kantara Siding
14		
15	28 .2	
16	28 .8	
17	29 .0	
18	29 .1	
19	33 .0	
20	34 .5	
21	39 .0	At El Guisr
22	41 .	At Khedives' Summer House
23	41 .2	At 1st pair of Beacons in Lake Timsah
24	41 .6	" 3rd " " " "
25	42 .2	" 5th " " " "
26	44 .6	At entrance of Suez part of Canal from L. Timsah
27	44 .8	
28		
29		
30	50 .	
31	to	At Serapeum
32	51 .2	
33		
34		
35	51 .5	Just South of Serapeum
36	69 .	
37	70 .8	Between beacons on the small Bitter Lake
38	71 .	
39	73 .1	At entrance to Suez part of Canal from Bitter Lakes
40	73 .4	
41	75 .3	At Chalouf
42	77 .3	At South end of Chalouf narrow cutting
43	79 .4	At Gare
44	81 .	At Madama
45	82 .3	
46	83 .	
47	83 .7	
48	84 .1	
49	84 .5	
50	85 .2	
51	85 .9	
52	86 .	Between two Northern Lights at Suez entrance to Canal.

Scale of Feet.

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

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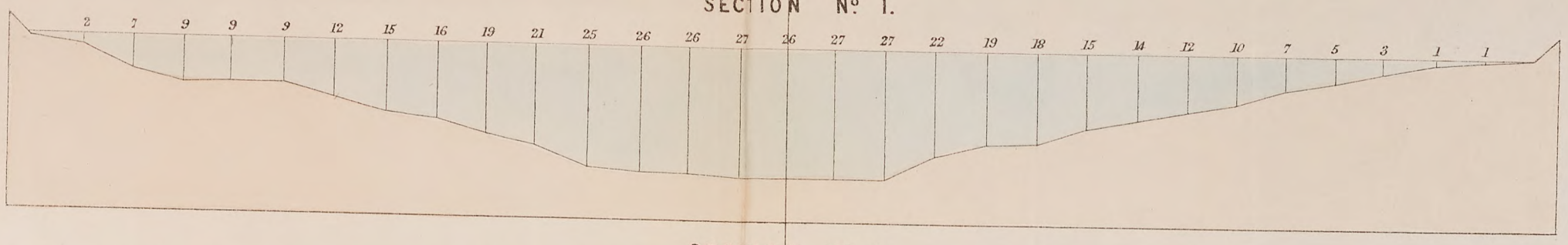
SECTIONS OF SUEZ CANAL.

Centre Line

WEST

EAST

SECTION Nº 1.



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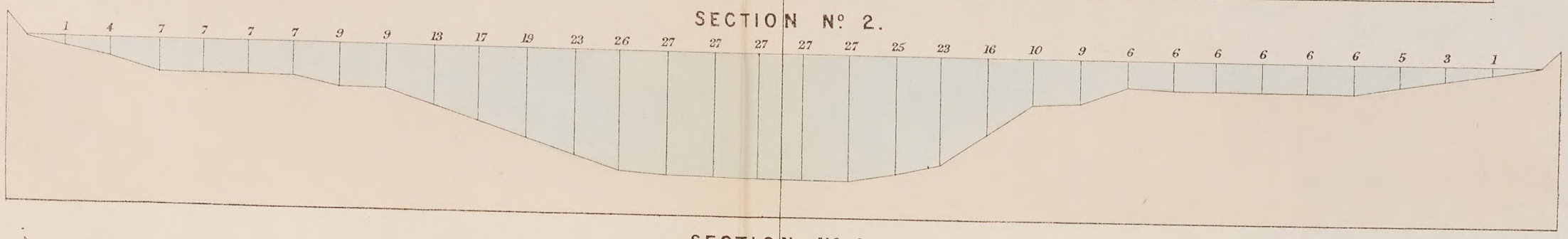

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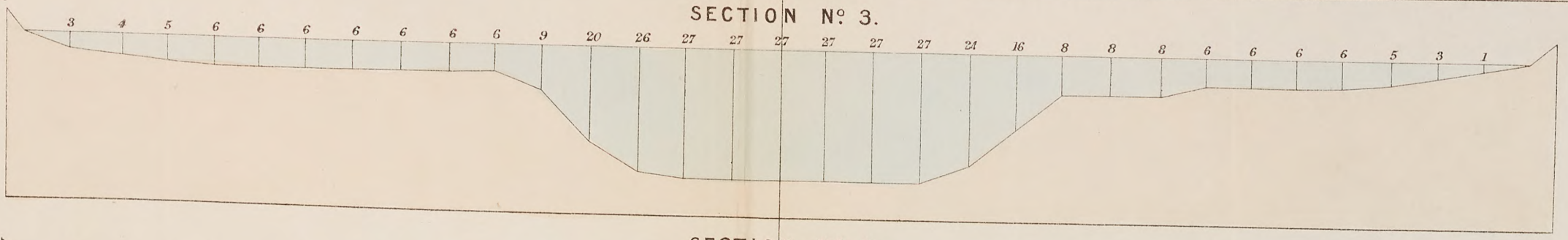

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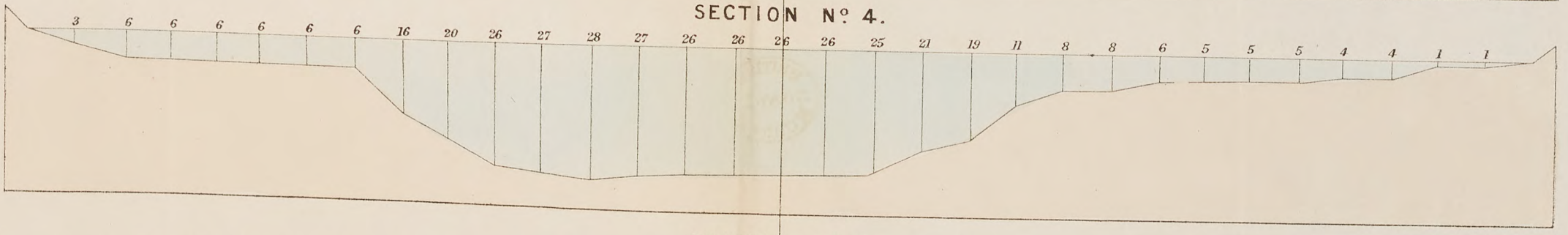

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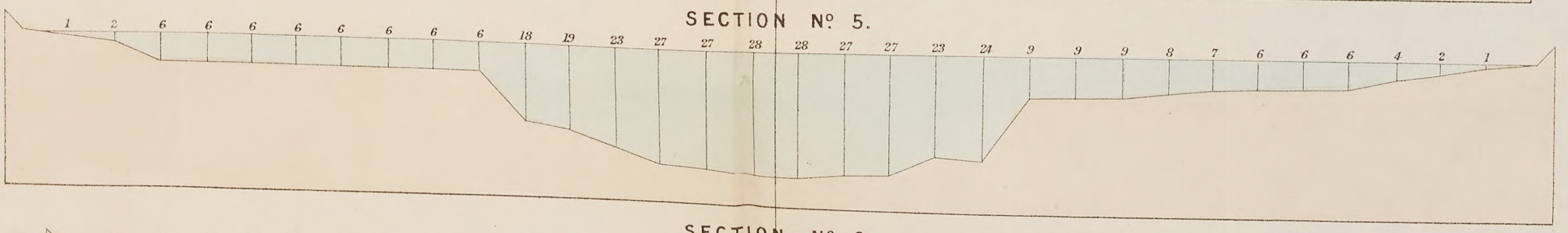

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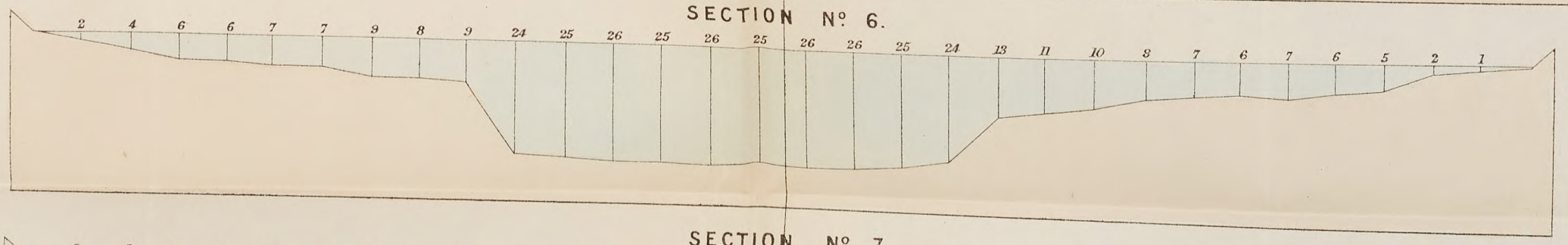

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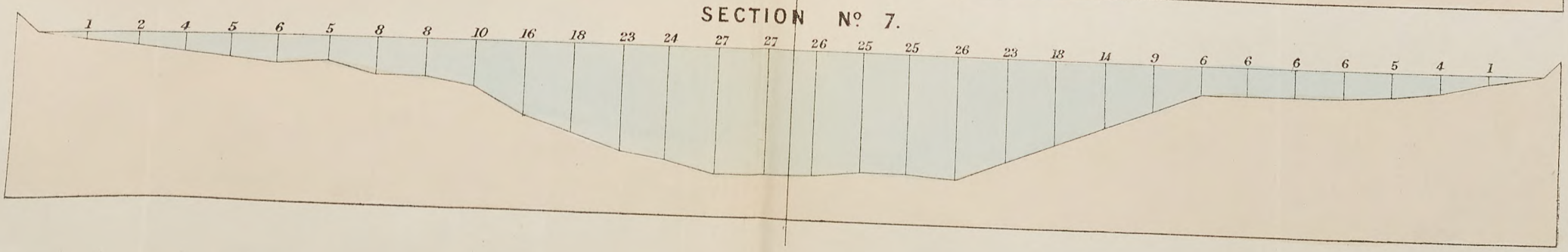

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SECTIONS OF SUEZ CANAL

Centre Line.

SECTION Nº 8.

3 5 6 6 6 9 9 9 13 17 21 24 24 24 24 24 24 24 23 17 11 9 8 7 7 7 7 6 3 1

SECTION Nº 9.

2 3 4 6 7 6 5 7 7 17 21 21 23 23 24 24 23 24 22 21 14 9 7 6 6 6 6 5 1 1

SECTION Nº 10.

2 3 5 7 7 7 7 8 9 16 20 21 22 23 23 23 23 23 22 19 16 9 8 5 6 5 6 5 1

SECTION Nº 11.

1 4 6 5 5 5 10 11 11 19 24 26 27 27 27 28 28 27 25 20 11 9 7 5 5 5 5 2 1

WEST

EAST

SECTION Nº 12.

1 5 7 7 5 7 10 10 9 7 18 24 27 27 27 28 27 27 27 27 28 28 28 27 25 16 9 8 6 6 6 5 6 6 1

SECTION Nº 13.

2 6 6 5 5 6 11 11 9 20 27 28 28 28 27 27 27 27 27 27 27 27 27 27 14 11 11 10 8 6 5 4 3 1

SECTION Nº 14.

2 6 7 7 6 7 8 9 11 17 25 26 27 27 27 26 25 25 26 26 26 26 26 26 25 17 9 8 8 7 6 6 6 3 1

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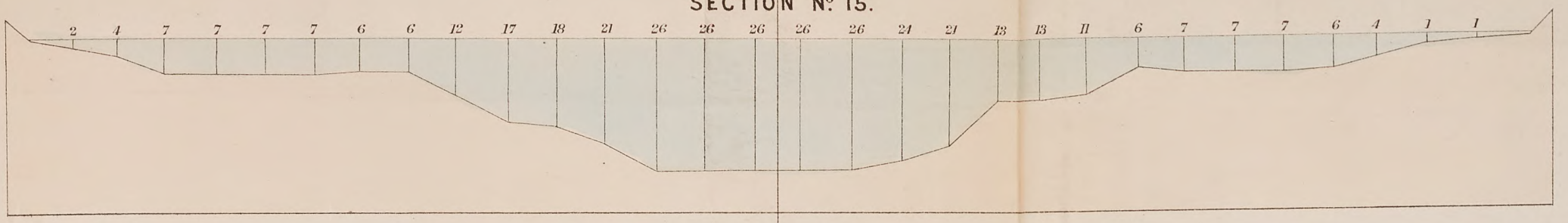
SECTIONS OF SUEZ CANAL

Centre Line

WEST

EAST

SECTION Nº 15.



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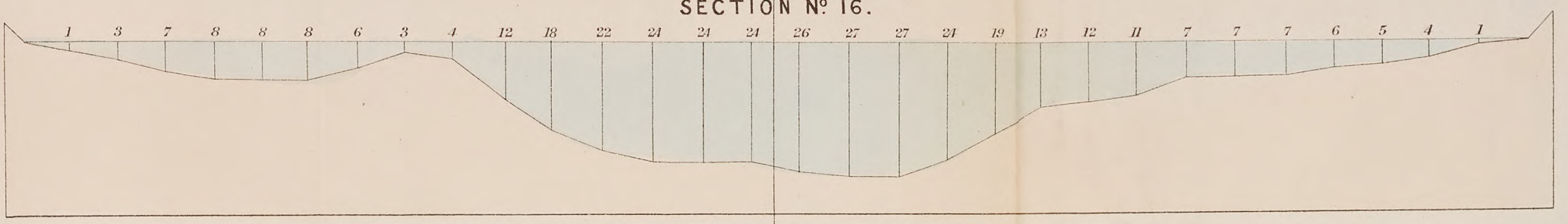

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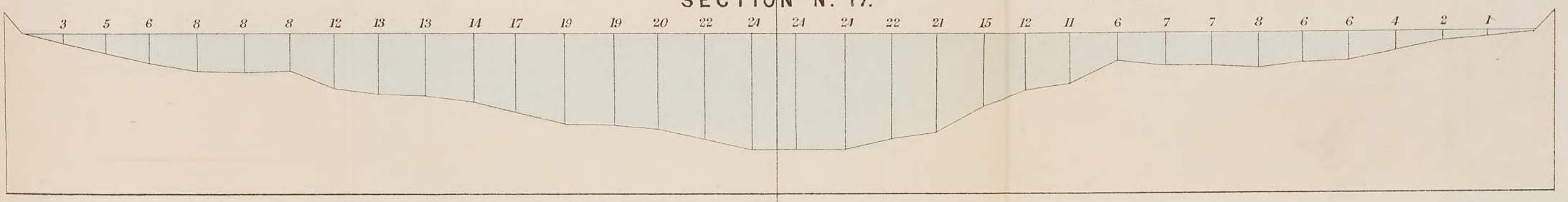

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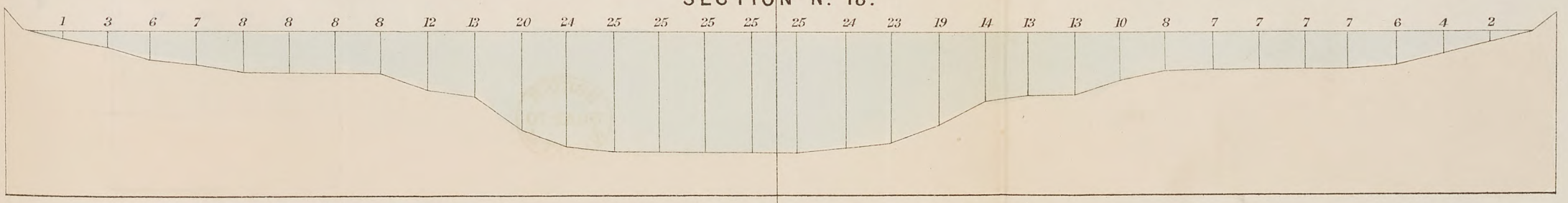

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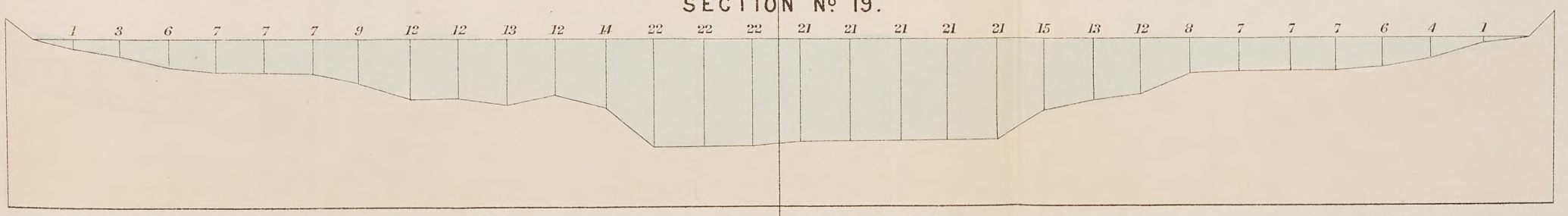

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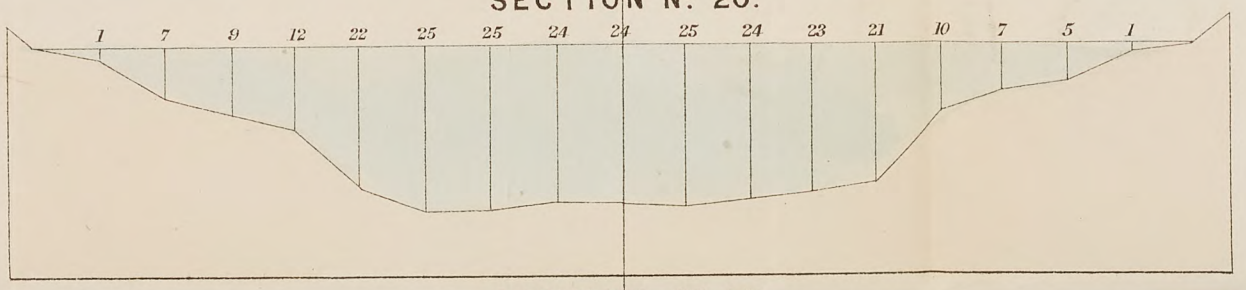

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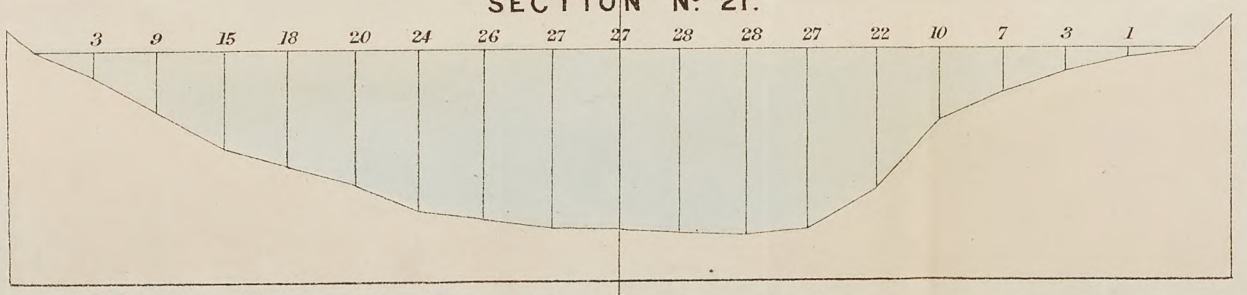

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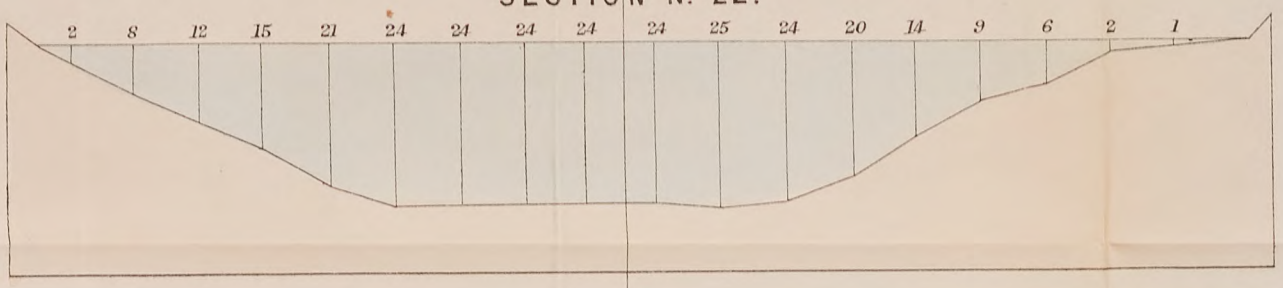
SECTIONS OF SUEZ CANAL.

Centre Line

WEST

EAST

SECTION Nº 22.



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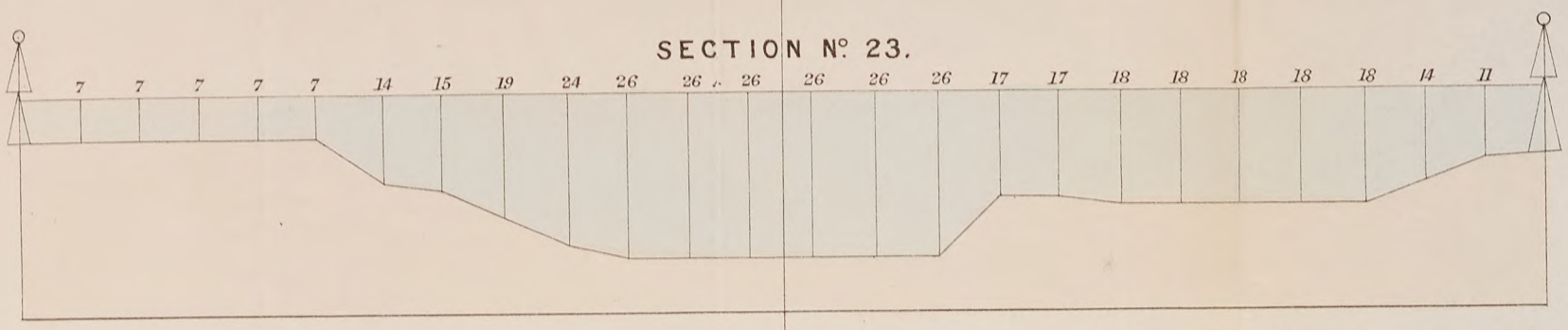

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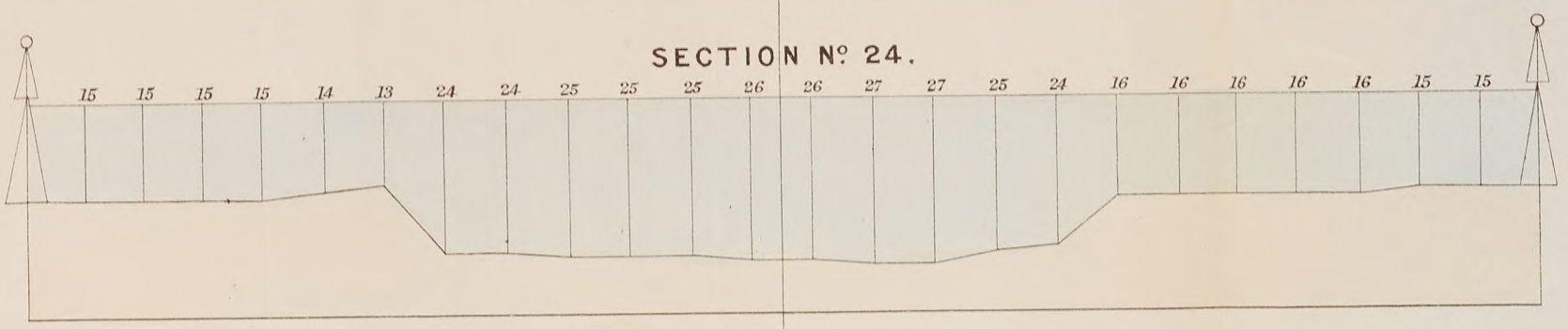

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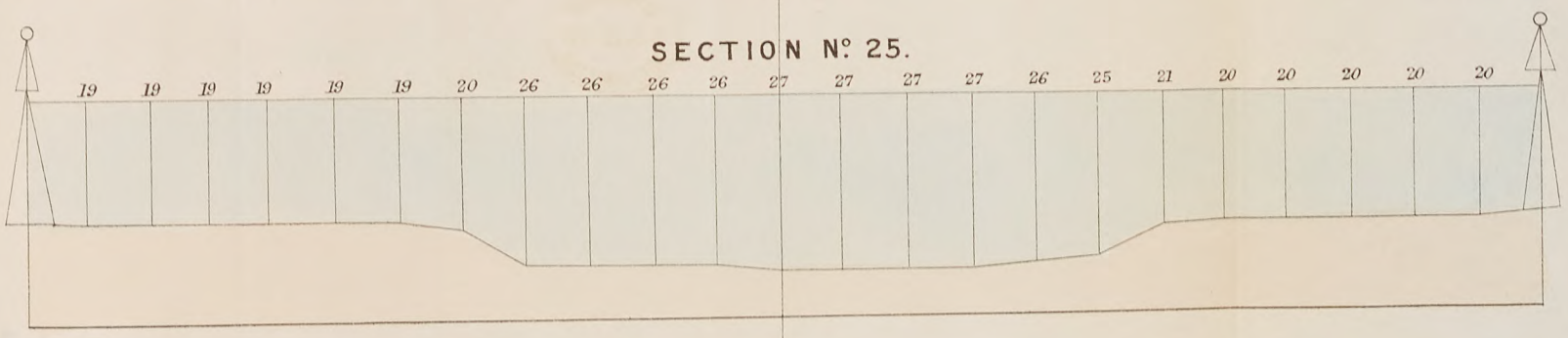

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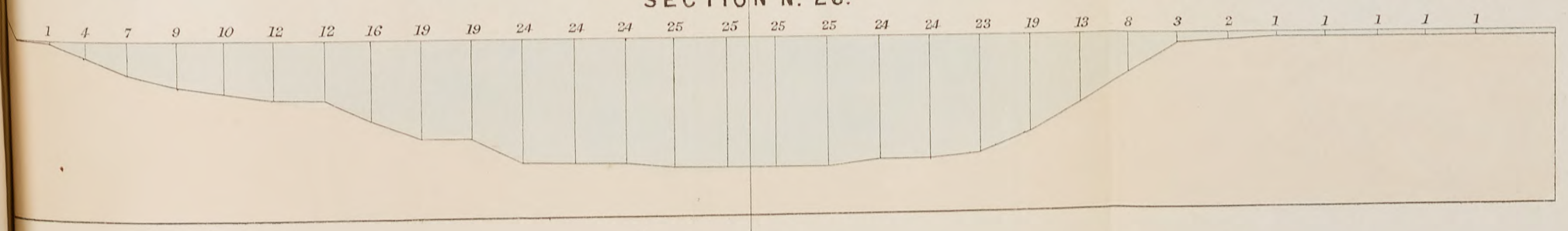

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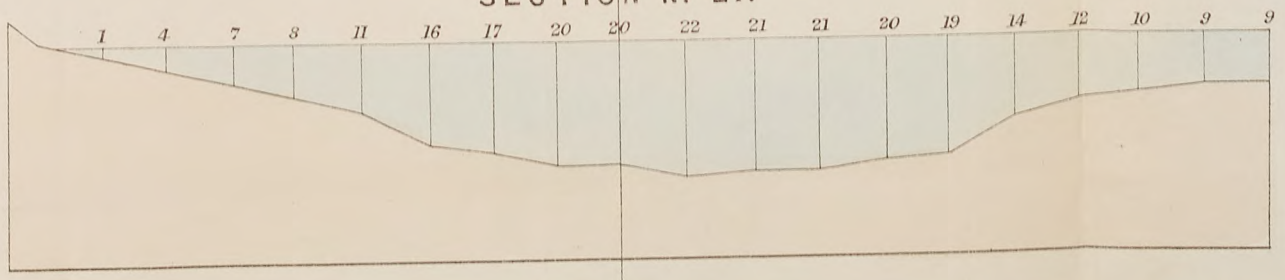

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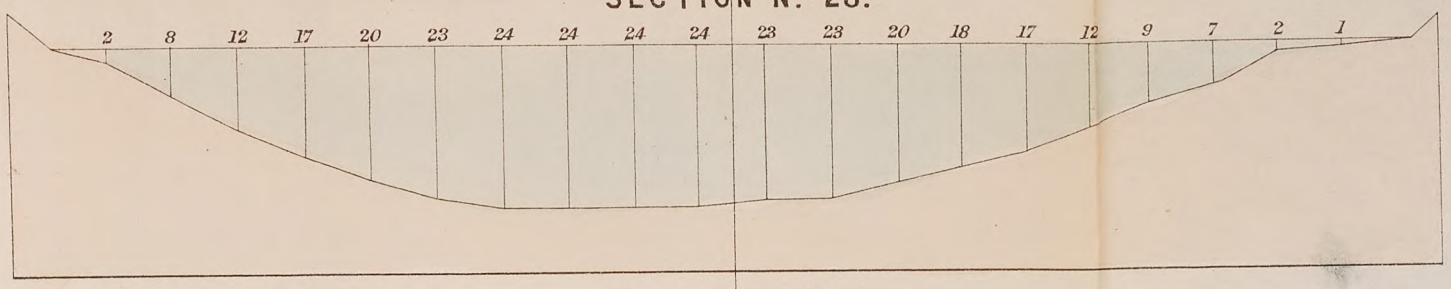
SÉRAPEUM SECTIONS.

WEST

Centre Line

EAST

SECTION Nº 28.



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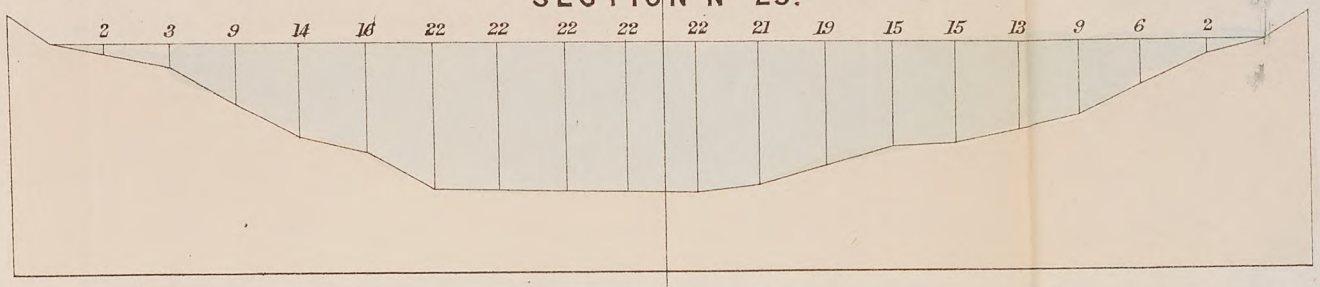

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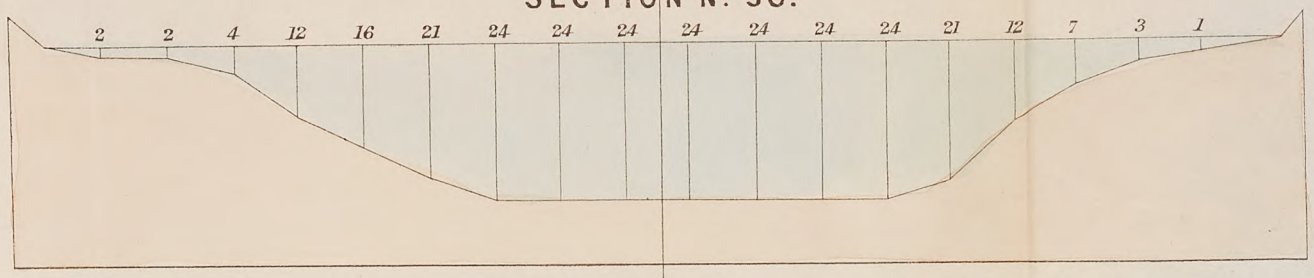

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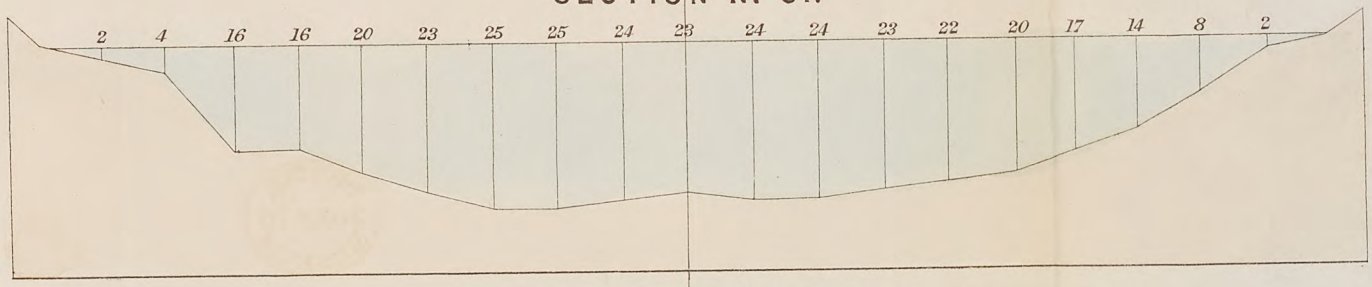

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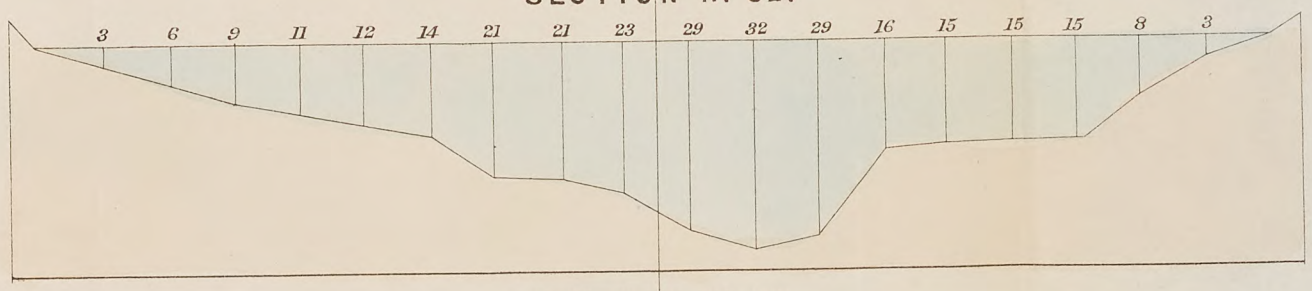

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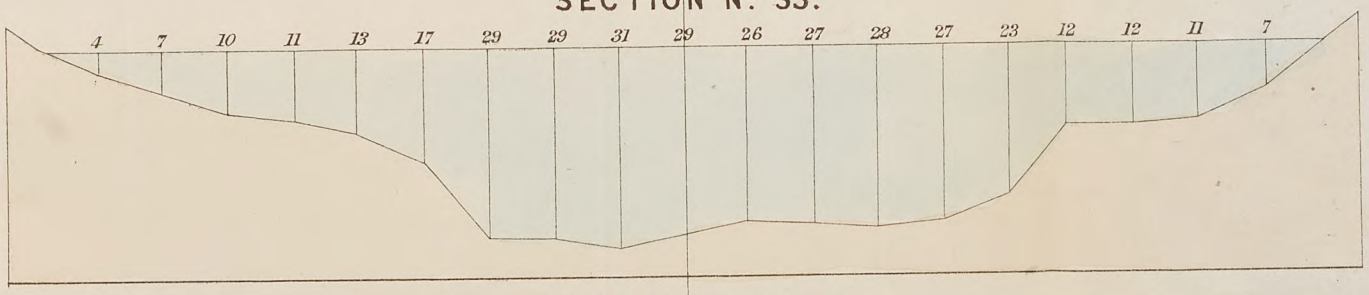

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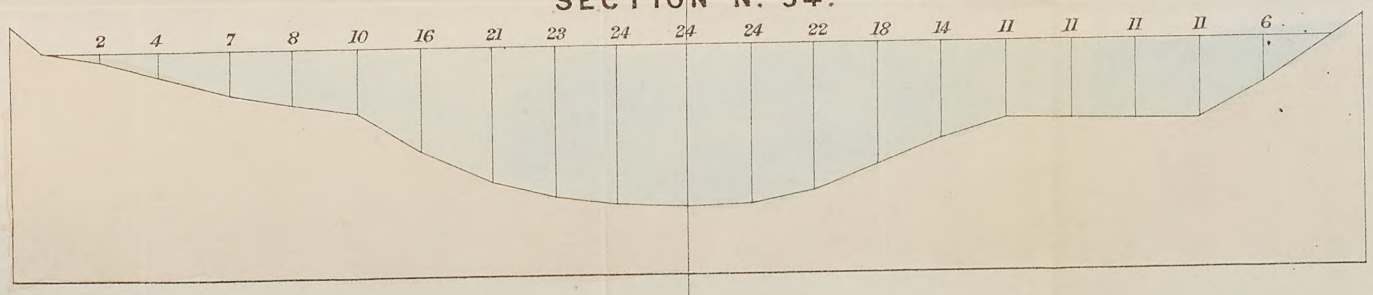

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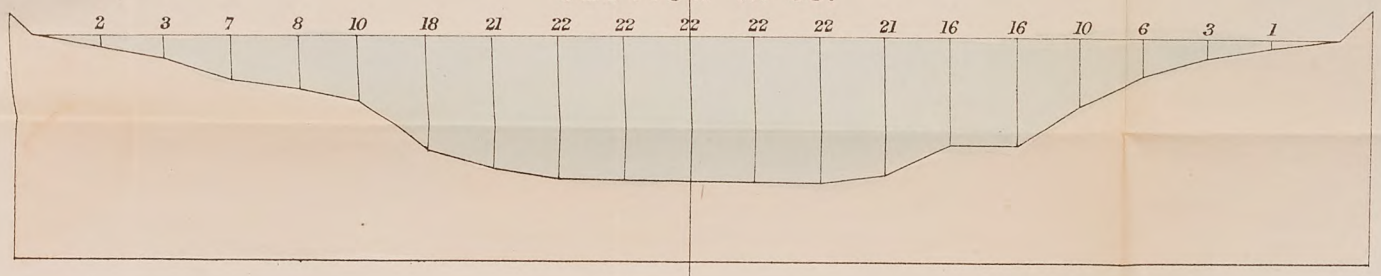
SERAPEUM SECTIONS.

Centre Line

SECTION Nº 35.



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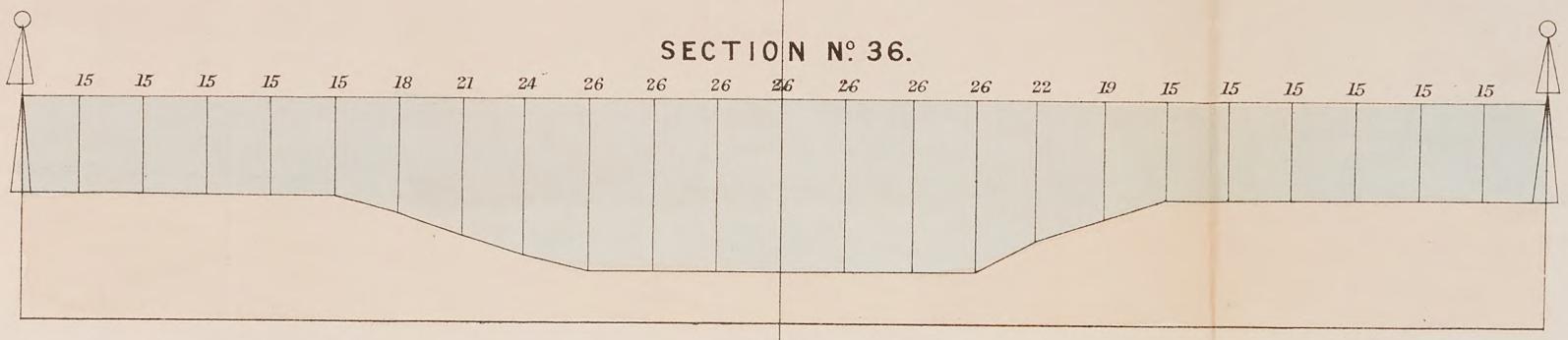

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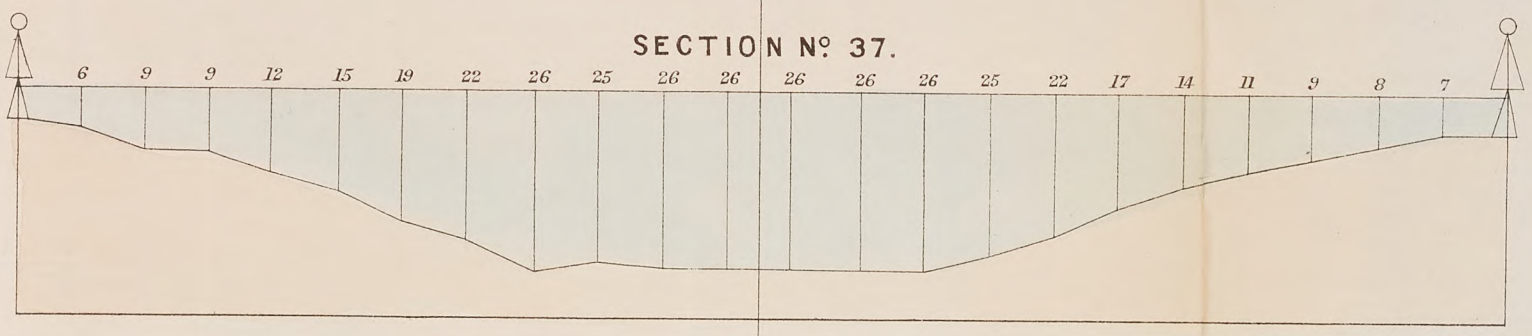
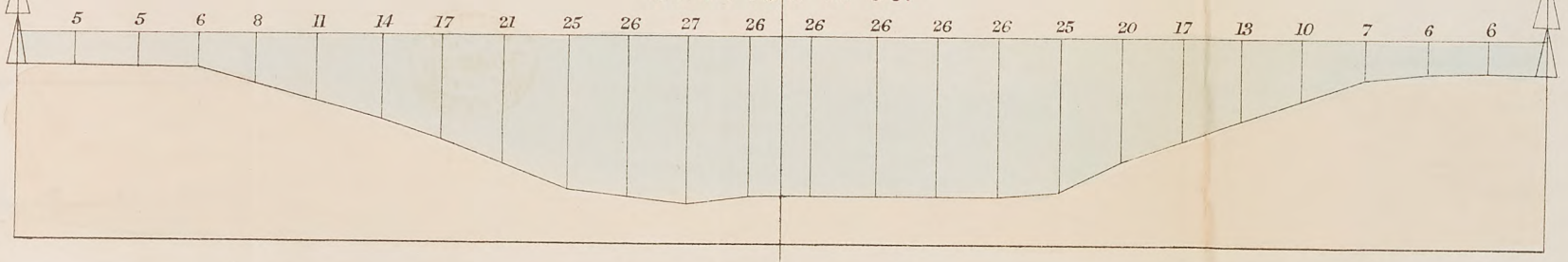


WEST

EAST

SECTION Nº 38.



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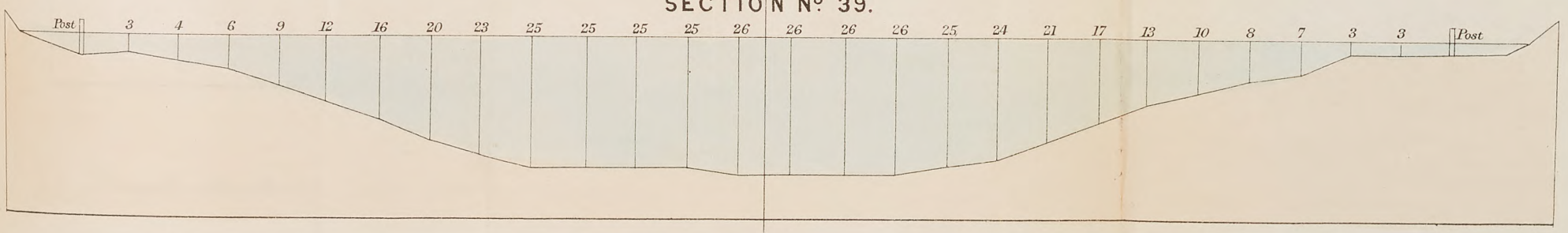

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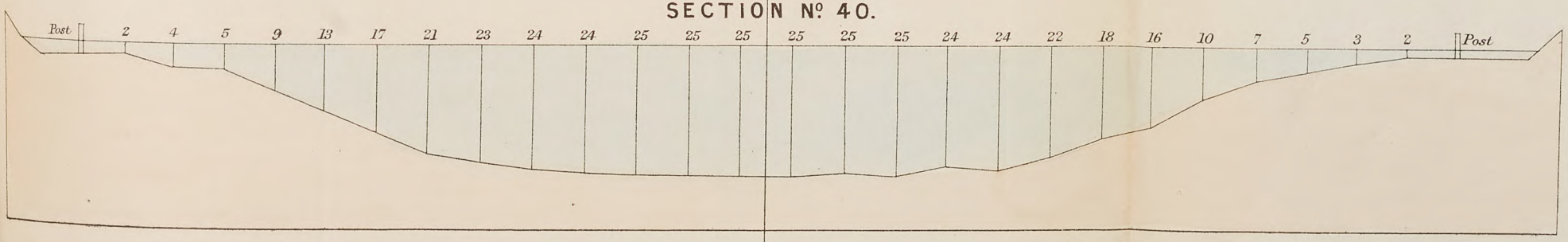

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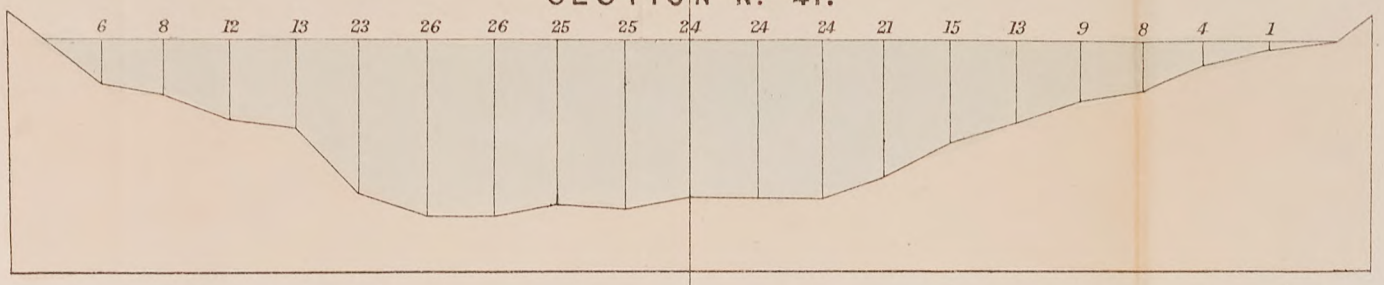
SÉRAPEUM SECTIONS.

Centre Line

WEST

EAST

SECTION Nº 41.



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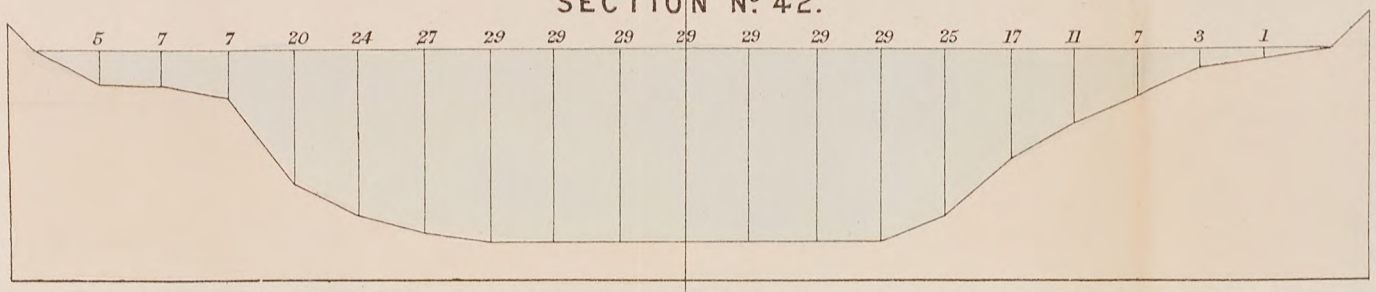

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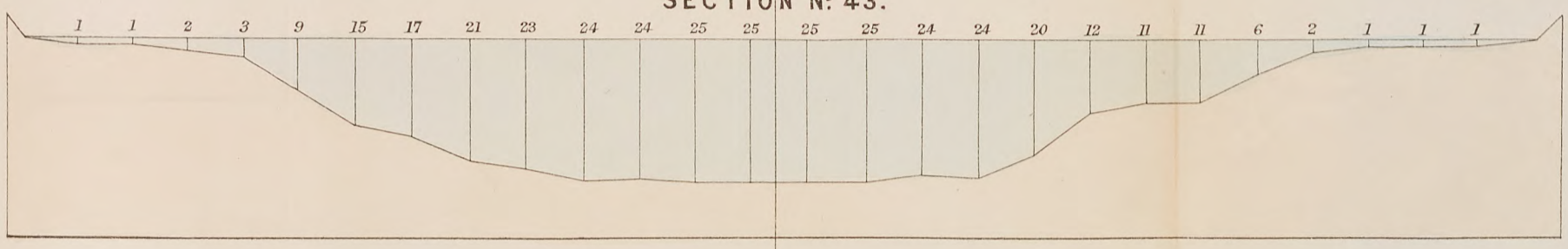

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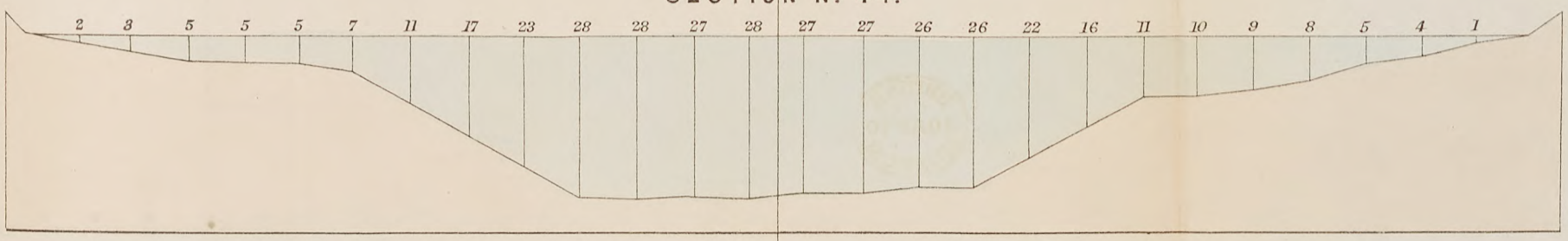

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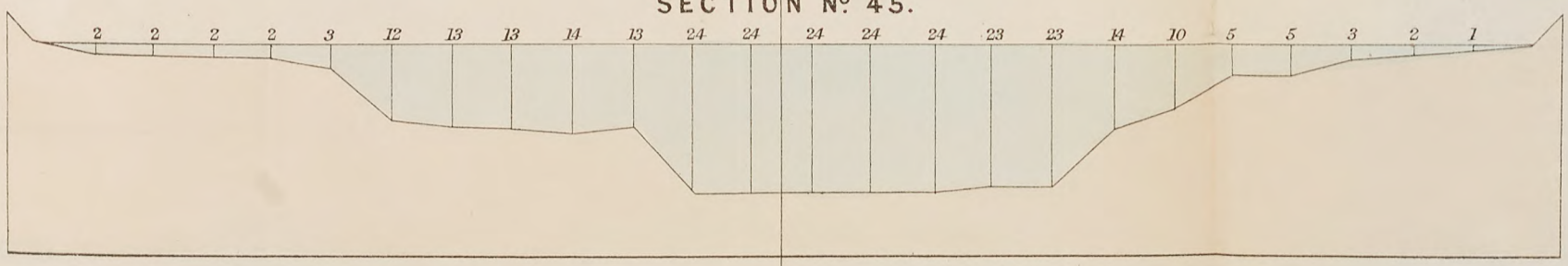

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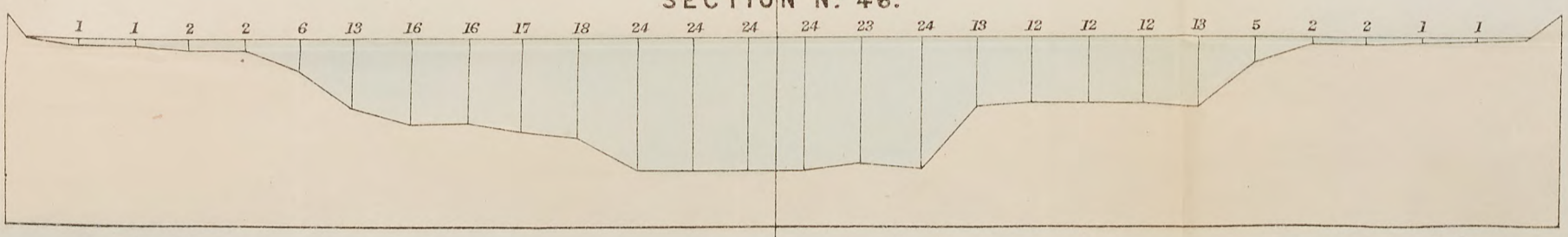

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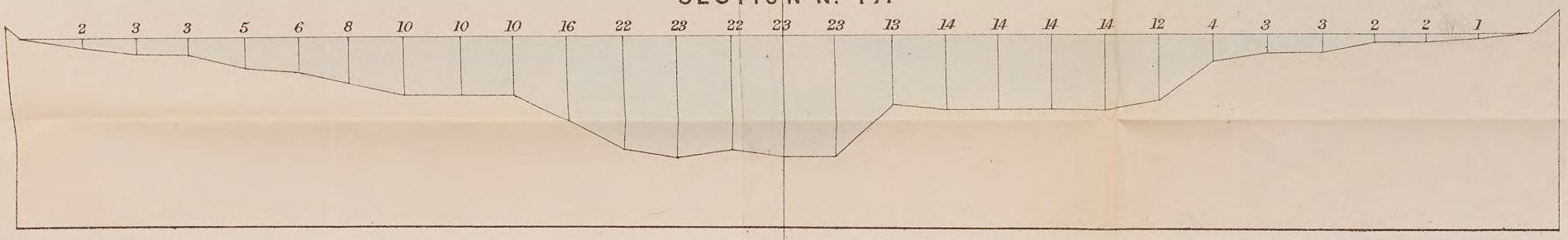
SÉRAPEUM SECTIONS.

Centre Line

SECTION Nº 47.



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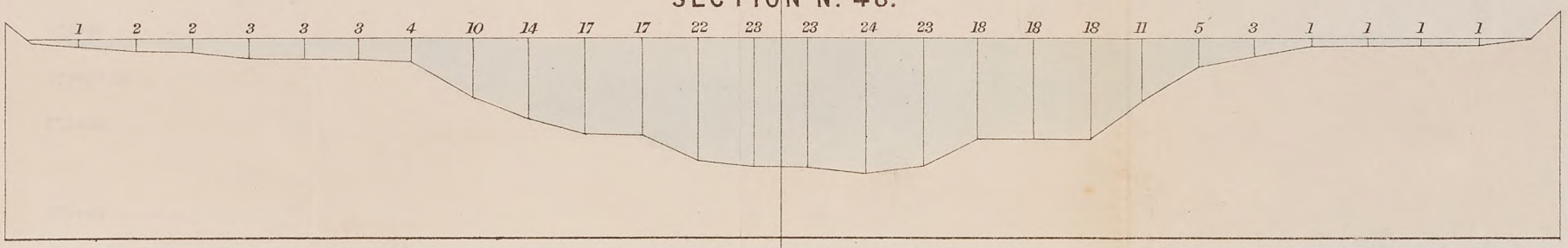

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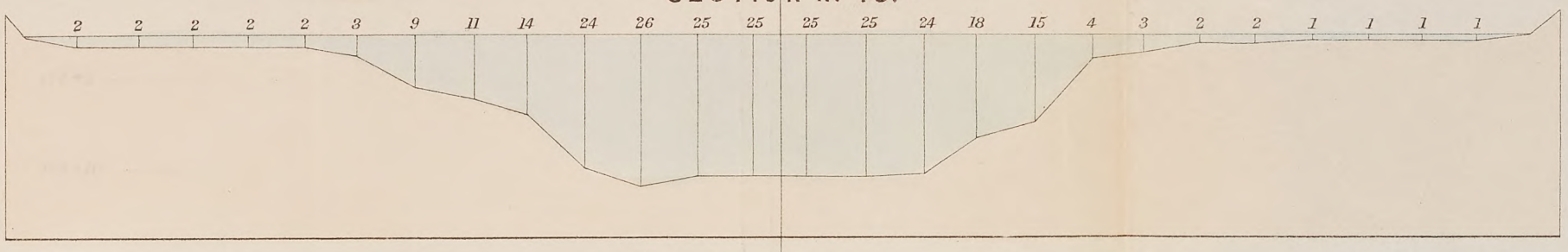
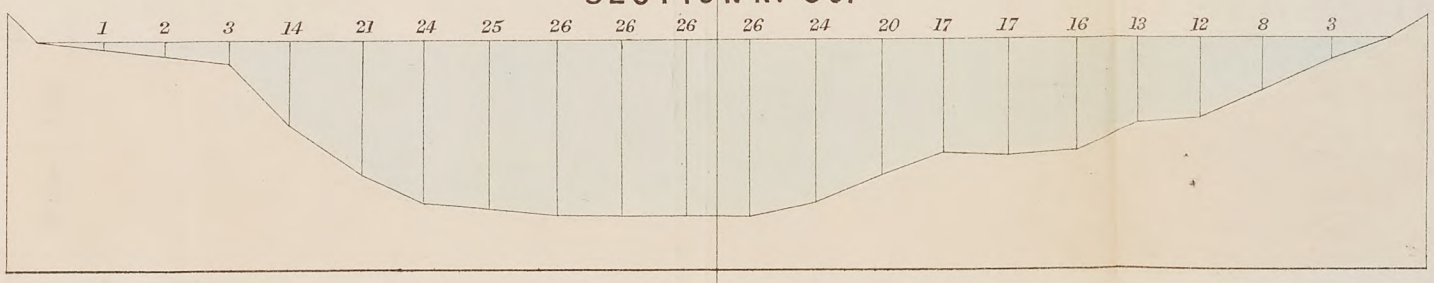


SECTION Nº 50.

WEST

EAST



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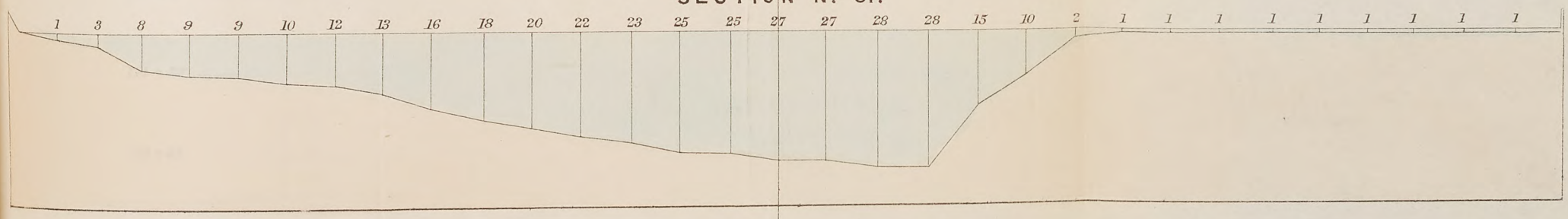

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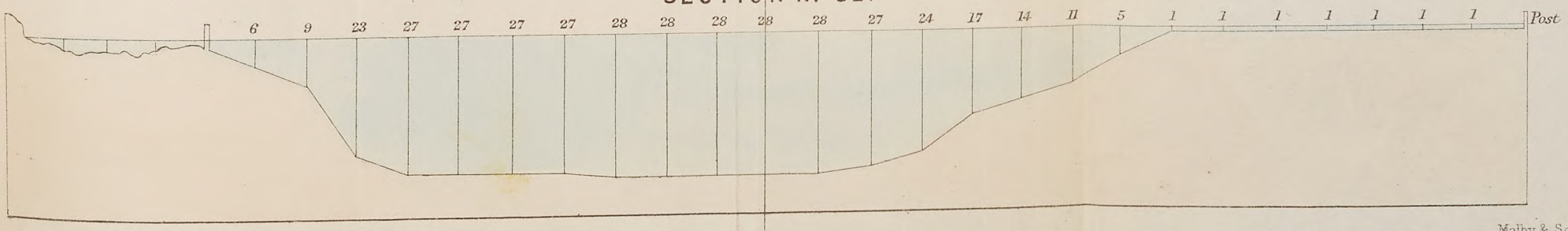

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SECTIONS IN COURSE OF RECONSTRUCTION FURNISHED BY THE COMPANY'S ENGINEER.

SÉRAPEUM SECTIONS.

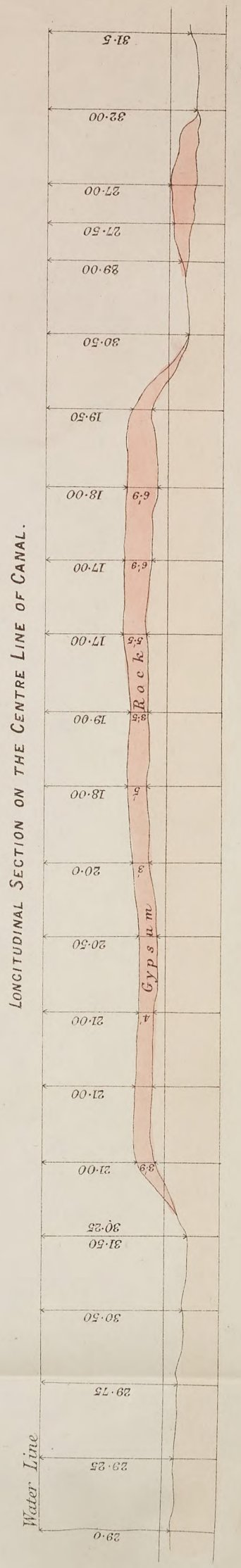
AFRICAN SIDE

	Water Line					Centre line of Canal.					Water Line				
173+75		6·25	6·50	12·25	13·75	21·25	32·25	32·50	30·0	31·50	32·0	32·25	31·50		
173+80		5·50	8·0	11·0	13·25	19·0	32·50	33·75	33·0	32·0	32·25	32·0	25·0	22·50	
173+85		6·0	8·0	11·0	13·0	14·0	22·00	31·0	32·0	27·00	31·0	23·50	21·0	19·0	19·0	18·50
173+87·50		6·0	9·50	12·0	12·0	14·0	22·50	31·0	31·50	27·50	31·50	29·50	23·0	19·0	18·00	18·0
173+90		7·0	9·5	12·25	13·50	14·0	17·25	21·50	22·50	29·00	30·0	24·0	20·5	17·00	18·0	18·0	17·00
173+95		6·50	9·50	11·50	12·50	14·0	16·50	26·0	30·50	30·50	30·50	25·50	18·0	17·25	17·50	17·50	16·75
174+																	
174+5																	
174+10																	
174+15																	
174+20																	
174+25																	
174+30																	
174+35																	
174+40																	
174+45																	
174+50																	
174+54																	
174+55								29·75	30·25	28·75	21·0	25	19·0	18·75	15·50	14·50	10·0
174+60								30·50	30·25	27·50	28·50		18·25	15·50	15·00	15·0	11·0
174+65								29·75	30·50	30·25	29·0		29·25	23·0	15·50	15·75	14·0
174+70								29·25	29·50	29·50	28·50		28·0	28·50	17·50	15·25	15·0
174+75								23·0	28·50	28·50	28·50		28·0	27·50	23·25	12·50	10·50

Scale of Feet.

100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

ASIATIC SIDE



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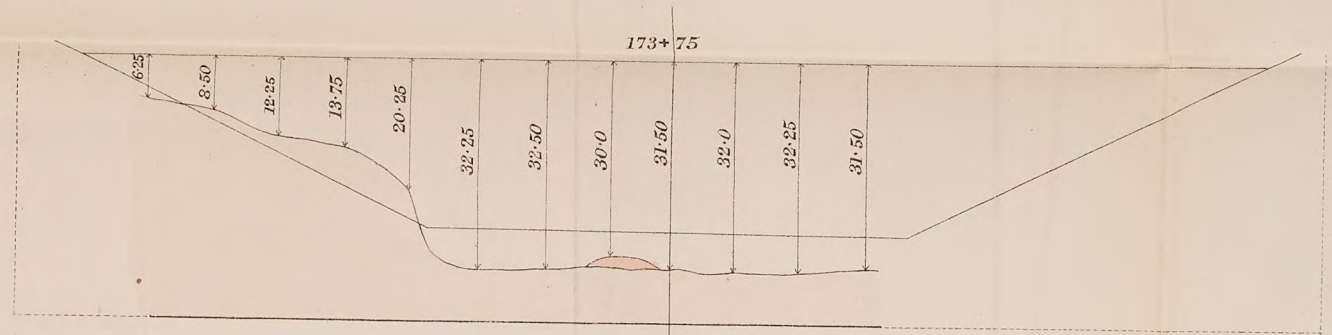
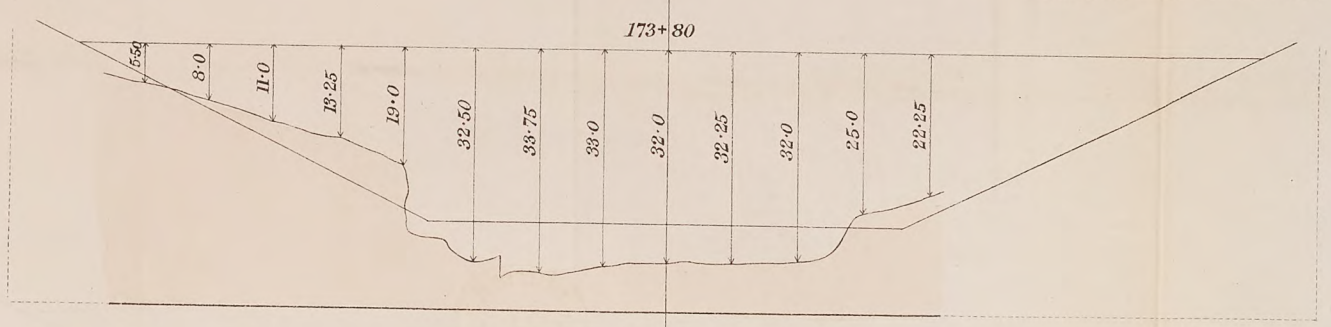
SECTIONS IN COURSE OF RECONSTRUCTION FURNISHED BY THE COMPANY'S ENGINEER.

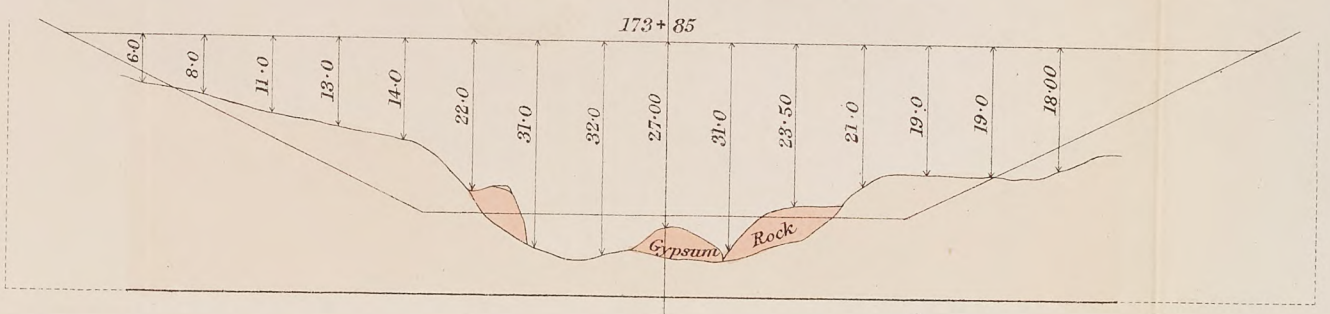
SERAPEUM SECTIONS.

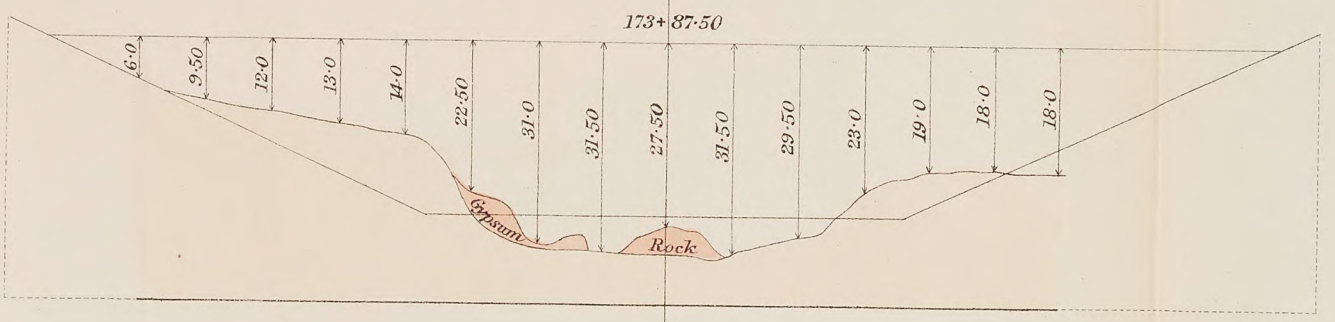
AFRICAN SIDE

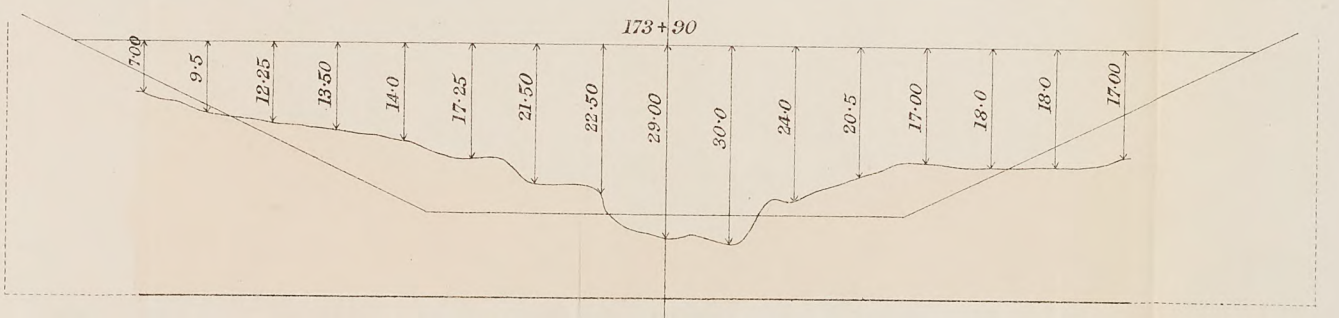
ASIATIC SIDE

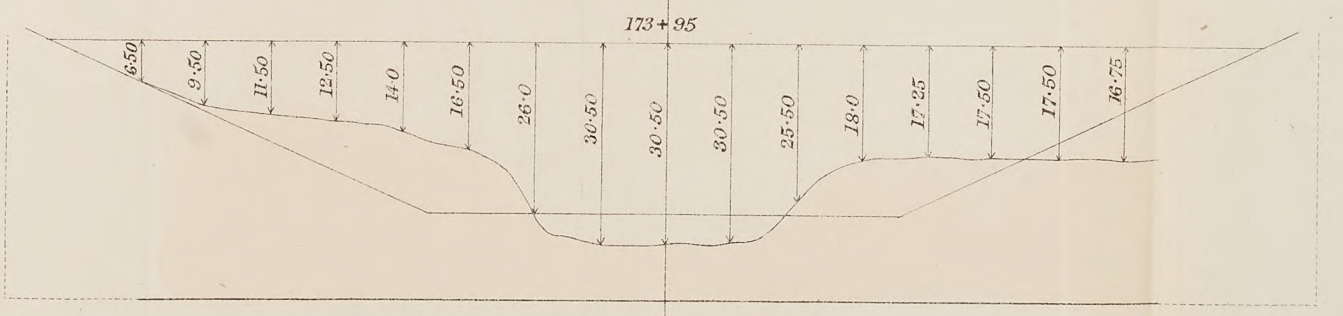












Scale of Feet.

100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

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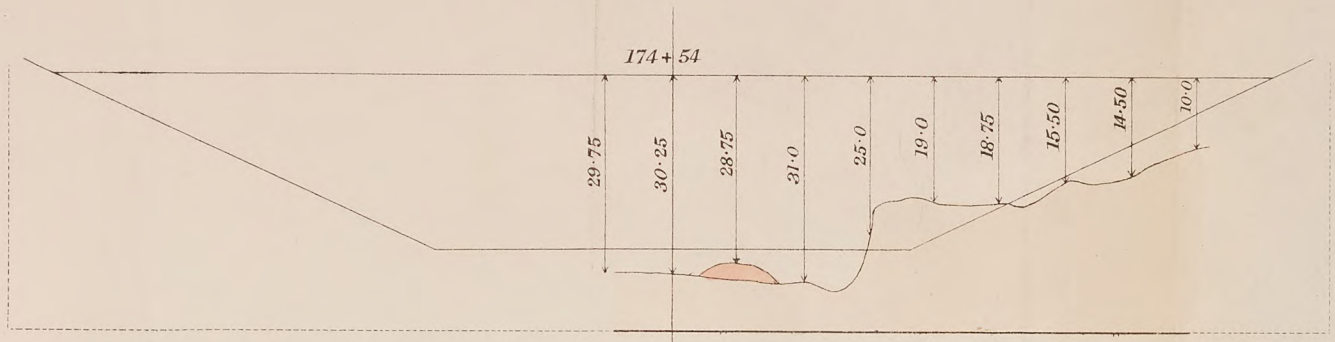
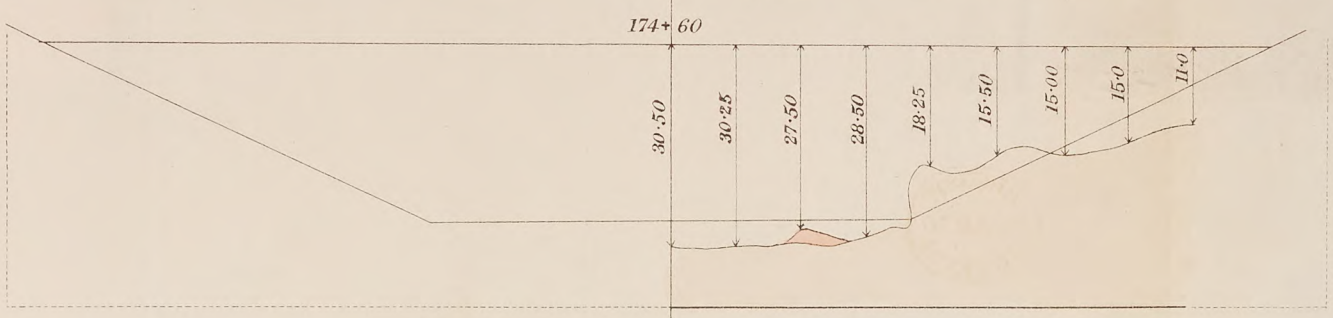
SECTIONS IN COURSE OF RECONSTRUCTION FURNISHED BY THE COMPANY'S ENGINEER.

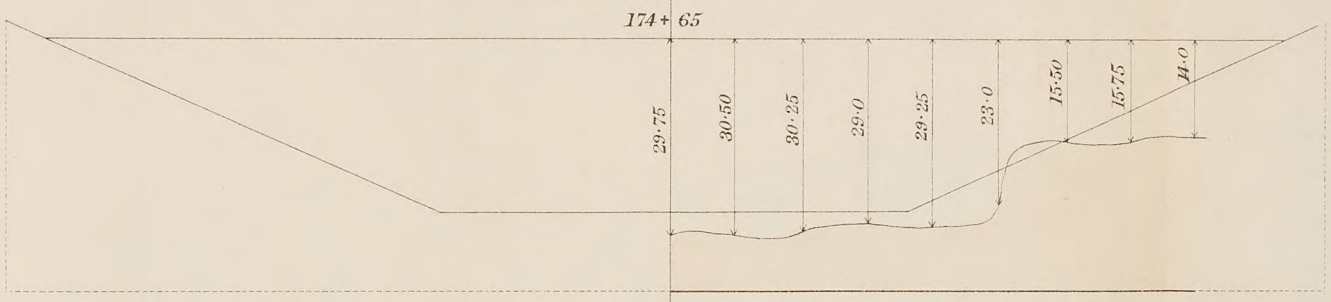
SÉRAPEUM SECTIONS.

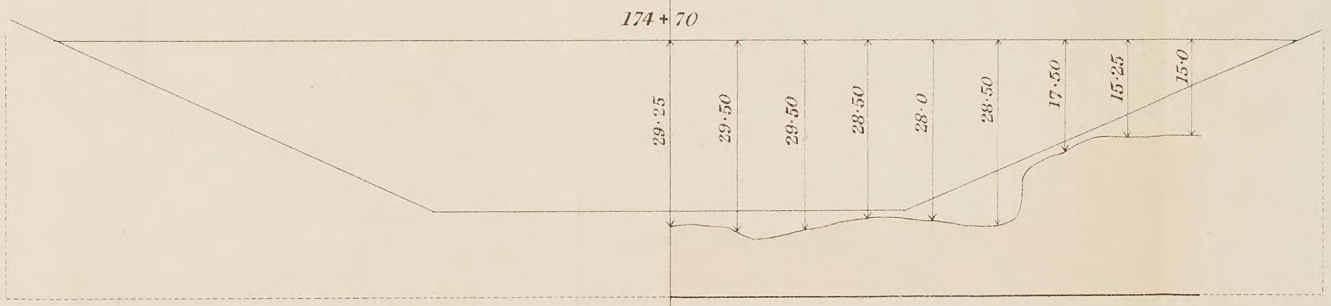


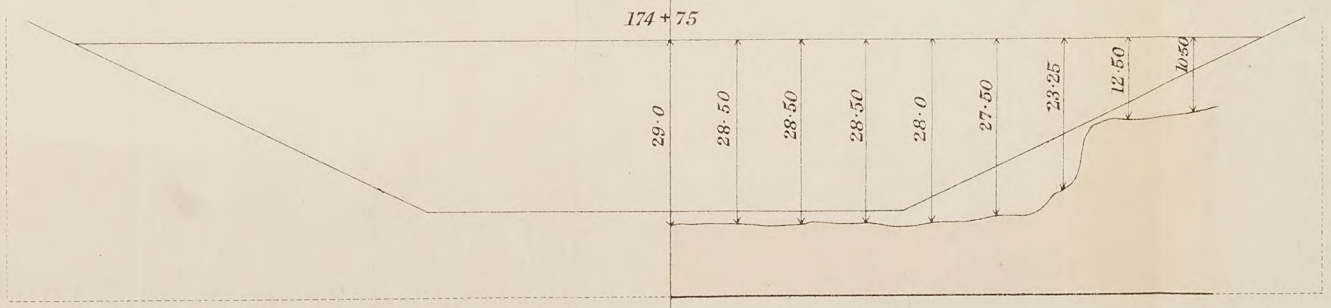


AFRICAN SIDE

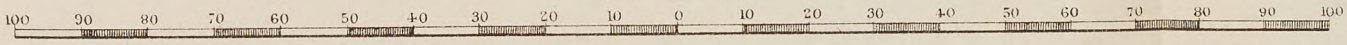
ASIATIC SIDE







Scale of Feet.



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